CALIFORNIA
ENERGY
COMMISSION

BEST MANAGEMENT PRACTICES & GUIDANCE MANUAL: DESERT RENEWABLE ENERGY PROJECTS

DRAFT STAFF REPORT


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Best Management Practices & Guidance Manual: Desert Renewable Energy Projects was prepared by the staffs of the California Energy Commission, California Department of Fish and Game, U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service. It does not necessarily represent the views of the agencies, the State of California or United States of America. The Energy Commission, Department of Fish and Game, Bureau of Land Management, U.S. Fish and Wildlife Service, the employees, contractors, and subcontractors make no warrant, express or implied, and assume no legal liability for the information in this report; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This report has not been approved or disapproved by the California Energy Commission, California Department of Fish and Game, U.S. Bureau of Land Management, or Fish and Wildlife Service, nor have the agencies passed upon the accuracy or adequacy of the information in this report.

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Abstract

Best Management Practices & Guidance Manual: Desert Renewable Energy Projects provides recommendations to renewable energy developers, and federal, state, local and Tribal governments for improving the efficiency of the regulatory process in California and protecting environmental and cultural resources, and human health and safety. The manual carries out portions of California Governor Executive Orders and the United States Department of Interior Secretarial Order on renewable energy resource development. The recommendations propose guidance and best management practices for timely processing of Desert Renewable energy project permits within the existing regulatory framework. The manual does not recommend changes to laws, regulations, or agency jurisdictions or responsibilities. Recommendations include 1) guidance for preparing applications for renewable energy projects located in the California desert region and 2) best management practices for the permitting / pre-construction, construction, operation, repowering or retrofitting, and decommissioning phases of desert renewable energy facilities. The manual also provides recommendations for project design features to be considered when developing such renewable energy projects.

Key Words: air quality, best management practices, biological resources, biomass , California, construction, cultural resources, decommission, desert, electricity, energy, environmental impact report, environmental impact statement, erosion, geothermal, guidance, hazardous materials, land use, noise, operation, paleontological resources, permitting, power plants, regulatory framework, renewable, repower, retrofit, safety, soils, solar, stormwater, traffic, transmission, transportation, visual resources, water supply, water quality, wind

Executive Summary

Governor Schwarzenegger signed Executive Order S-14-08 on November 17, 2008 which requires that 33 percent of the electricity sold in California come from renewable energy resources by 2020. The Order also directs the California Natural Resources Agency to lead a joint collaboration between the California Energy Commission (Energy Commission) and Department of Fish and Game (DFG) to expedite the development of Renewable Portfolio Standard (RPS) eligible renewable energy resources. The Governor's new Executive Order S-21-09 issued on September 15, 2009 reiterates and strengthens the goals of S-14-08. In addition, United States Department of Interior Kenneth Salazar issued Secretarial Order 3285 in March 2009 to make production, development and delivery of renewable energy one of the Department's highest priorities. Currently, Governor Schwarzenegger and Secretary Salazar are developing a Memorandum of Understanding to confirm commitments to the development of renewable energy projects in California and to prepare Interim Developer Guidance to assist solar project developers design and site projects in an environmentally suitable manner.

Pursuant to the orders and related memoranda the administrations are 1) identifying areas in the Colorado and Mojave deserts suitable for future renewable energy development and resource conservation, and 2) developing a conservation strategy that will lead to completing the Desert Renewable Energy Conservation Plan. Another major requirement of the Executive Order is to prepare a Best Management Practices (BMP) manual by December 31, 2009.

This draft BMP manual has been developed collaboratively among the California Energy Commission, DFG, Department of Interior's Bureau of Land Management (BLM), Fish and Wildlife Service (FWS) . The agencies form the nucleus of the Renewable Energy Action Team (REAT) and have been active in completing the tasks outlined in the Executive and Secretarial Orders. The manual is being developed with extensive input from the Desert Managers Group which is developing solar energy project BMPs.

This draft manual has been prepared to: a) help ensure that desert renewable energy project developers understand and meet federal, state and local renewable energy and environmental requirements; b) assist developers in designing renewable energy projects that minimize environmental impacts; and c) accelerate the environmental review of renewable energy projects and the local, state, and federal permitting processes. While the pre-application filing guidance and BMPs are specific to renewable energy projects in the California deserts, they may be applicable in other states where similar resource issues occur. For projects that involve resources not addressed in this manual, project proponents should contact the appropriate regulatory and resource agencies in their respective states for guidance.

Because this document complements existing National Environmental Protection Act (NEPA) and California Environmental Quality Act (CEQA) guidance, implementing the activities and practices listed in this manual will support efforts to comply with NEPA, CEQA and other federal, state, and local environmental, energy development and wildlife laws. Following the suggestions in this manual will facilitate the issuance of required permits for a project and improve the efficiency and speed of the regulatory process.

There is inadequate time in an accelerated project review process to systematically address and resolve readily known and predictable issues associated with a project after applications are filed. To assist the agencies in reducing the time associated with the permitting process, project developers should identify and address these issues by proposing appropriate project design features and environmental impact avoidance and mitigation measures as part of an application to the Energy Commission, a right-of-way application to BLM, and an application

with another appropriate lead agency (such as the U.S. Environmental Protection Agency, California State Lands Commission or local government). If pre-application filing actions applicable to a project are not incorporated into an application and the design of the project, or the project is changed or modified after an application is filed, significant delays are likely and would hinder the ability of BLM, the Energy Commission, DFG, FWS, and other agencies to process permits in a timely manner. Early identification of impacts / mitigation measures and continuous coordination with appropriate regulatory agencies is essential.

This draft BMP and guidance manual contains many valuable suggestions that will assist developers in designing projects that minimize environmental and public health / safety impacts. Incorporating the applicable actions into the development of a renewable energy project before an application is filed is essential to an accelerated permitting process. Ideally, for projects to be permitted in a time efficient manner consistent with the Executive and Secretarial Orders and the RPS, renewable energy developers should complete the following critical activities before they file applications with BLM, the Energy Commission and other lead agencies.

1. The renewable energy project is proposed to be located on land identified by REAT that is suitable for renewable energy development. The REAT is expected to identify draft study areas by January 2010.

2. The project will not use fresh ground water or surface water for power plant cooling.

3. The appropriate biological resource surveys have been completed using the proper protocols during the appropriate season.

4. A draft biological assessment (BA), if required for the project, has been tentatively approved by FWS, DFG and the appropriate lead agencies. The draft BA must include a complete draft project description, full description and assessment of project impacts and species affected, and project impact mitigation measures that have been reviewed by the appropriate agencies.

5. The appropriate cultural resource surveys, assessments, and project impact mitigation measures have been completed following the proper protocols and standards.

6. Ensure that all BLM requirements and Resource Management Plans have been addressed and incorporated in the project design, for projects located on BLM managed lands. Projects should be consistent with guidance in the BLM programmatic wind and geothermal Environmental Impact Statements (EISs), and after publication, the BLM programmatic solar EIS.

7. All the requirements of the local agency jurisdiction have been incorporated into the applications including but not limited to local zoning, general plan policies, land use, traffic, and height restrictions. The project will not be located on lands under a Williamson Act contract, require a zoning change, or General Plan amendment.

8. All of the requirements of the Department of Defense and nearby military installations have been addressed and incorporated into a project's design.

9. A transmission system interconnection study has been completed by the California Independent System Operator (CAISO) or other control area operator with measures identified and agreed upon that would eliminate any unacceptable degradation to the reliability of the transmission system beyond the first point of interconnection.

10. A power purchase agreement has been executed for the proposed project.

11. A preliminary Determination of Compliance is included with project applications to appropriate lead agencies, if a project will likely create air emissions during construction or operation.

This draft manual is offered to project developers when developing a renewable energy project and regulatory agencies reviewing and permitting a renewable energy project application. The recommendations contained in the manual do not duplicate or supersede NEPA, CEQA, Warren-Alquist Energy Act and regulations, Federal Endangered Species Act, California Endangered Species Act statutes or other legal requirements. This document does not alter lead agencies' obligations under NEPA, CEQA, or the Warren-Alquist Energy Act, nor does it mandate or limit the types of studies, mitigation, or alternatives that an agency may require. Local and Tribal jurisdictions, when reviewing and permitting renewable energy projects, are encouraged to use the guidance and BMPs when appropriate.

This draft manual is currently being reviewed by state and federal agencies. It has also been made available to local and Tribal governments, renewable energy developers, the public, and stakeholders for their review and comment. The manual will be the subject of a workshop in Victorville, California, on October 13, 2009. At the workshop, the manual will be discussed and comments encouraged. Written comments are due on October 27, 2009. Based on the review and comments, the appropriate changes will be made. Additional opportunities to provide public input may be offered depending on the input received at the workshop.

Note: This manual includes, in its first chapter, the draft *Interim Guidance for Desert Renewable Energy Project Development* released on September 30, 2009. The BMP manual is intended to replace the earlier Interim Guidance document.

Introduction and Purpose

Electricity generated from renewable energy sources is expected to serve a vital role in meeting California's energy needs. The State's renewable energy goal is for 33 percent of the electricity sold in California to be generated from renewable energy resources by 2020. At the same time California moves to achieve its renewable energy commitments, it must also maintain and protect the state's human, cultural and natural resources.

Governor Arnold Schwarzenegger issued Executive Order S-14-08 on November 17, 2008 which directs the California Natural Resources Agency to lead a joint collaboration between the California Energy Commission (Energy Commission) and Department of Fish and Game (DFG) to expedite the development of Renewable Portfolio Standard (RPS) eligible renewable energy resources. On September 15, 2009 the Governor signed Executive Order S-21-09 reiterating and strengthening S-14-08 by directing California Air Resources Board (CARB) to work with the California Energy Agencies to adopt regulations to implement the 33 percent by 2020 renewable energy goal. U.S. Department of Interior Secretary Kenneth Salazar's Order 3285, issued on March 11, 2009, establishes a policy of encouraging the production, development and delivery of renewable energy as one of the Department's highest priorities. The Energy Commission, DFG, U.S. Department of Interior, Bureau of Land Management (BLM) and Fish and Wildlife Service (FWS) are working cooperatively and collaboratively to create a more efficient process for timely permitting of renewable energy facilities located in the desert region of California.

The agency managers (Renewable Energy Action Team or REAT) are coordinating governmental regulatory actions among federal and state agencies and cities, counties and special districts located in the desert region. The coordination is necessary to carry out the Executive and Secretarial Orders and related Memoranda of Understanding and Agreement (MOUs / MOA), and to address complex permitting issues within the existing regulatory framework. It is likely that any renewable energy project would require multiple permits, licenses, leases, agreements, consultations or certifications before beginning operation. The REAT is working to address the requirements for regulatory approvals within a single coordinated process. Refer to Appendix A: Regulatory Framework for information on agency and local government roles, authorities and desert renewable energy related memoranda.

Pursuant to Orders S-14-08, S-21-09, 3285 and the MOUs / MOA the purpose of the *Best Management Practices &Guidance Manual: Desert Renewable Energy Projects* is to: a) help ensure that desert renewable energy project developers understand and meet federal, state and local renewable energy and environmental requirements, b) provide guidance for timely processing of renewable energy applications and c) recommend best management practices (BMPs) to regulatory agencies and project developers. Information in the manual was specifically designed to be flexible to accommodate federal, Tribal, state and local concerns. Agencies with project approval authority are encouraged to consider and adapt, where warranted, the guidance and recommendations when permitting and authorizing projects under their respective jurisdictions. While the pre-application filing guidance and BMPs are specific to renewable energy projects in the California deserts, they may be applicable in other states where similar resource issues occur. For projects that involve resources not addressed in this manual, project proponents should contact the appropriate regulatory and resource agencies in their respective states for guidance.

The recommended pre-application filing activities / guidance and BMPs may need to be adjusted to accommodate unique, site specific conditions in the desert region. The recommended activities and practices in the manual are adaptable to address the specifics of

each site such as frequency and type of wildlife use, terrain, location relative to other land uses, and availability of scientifically accepted data.

Because this document complements existing National Environmental Protection Act (NEPA) and California Environmental Quality Act (CEQA) guidance, implementing the activities and practices listed in this manual will support efforts to comply with NEPA, CEQA and other federal, state, and local environmental, energy development and wildlife laws. Following the suggestions in this manual will facilitate the issuance of required permits for a project and improve the efficiency of the regulatory process.

This manual recommends: 1) guidance for preparing applications to lead agencies during the pre-application phase (prior to agency acceptance of a renewable energy project application as complete for environmental review and permit processing) and 2) BMPs for the post-application phases (permitting / pre-construction, construction, operation, repowering or retrofitting, and decommissioning) of desert renewable energy facilities. BMPs are suggested practices (or combination of practices) that provide the most effective, environmentally sound, and economically feasible means of managing a project or facility and mitigating the impacts. This manual also provides recommendations for project design features that should be considered when developing a renewable energy project in the desert.

Public Review Process

The REAT is developing the *Best Management Practices & Guidance Manual: Desert Renewable Energy Projects* based on the project review, and regulatory experience and expertise of its agency staff. While the draft manual is currently being reviewed by federal and state agencies, the REAT is interested in receiving comments from local and Tribal governments, community and environmental organizations, renewable energy developers, and private citizens. The intent is to offer the document as a reliable resource for the parties involved in the development and review of renewable energy projects to be located in the Mojave and Colorado Deserts of California.

There will be ample opportunity for public review of the draft manual. REAT's current schedule calls for public review of the draft manual, a related public workshop, scheduled for October 13, 2009, and receipt of comments by October 27. Depending on comments received, there may be public review on a revised draft manual. REAT agencies are scheduled to adopt the final manual by December 31, 2009, the deadline stated in S-14-08.

The Desert Region

The Desert Renewable Energy Conservation Plan planning area, generally the Mojave and Colorado Desert regions in California, comprises the geographic scope for this manual (Figure 1). The western boundary of the planning area encompasses the Renewable Energy Transmission Initiative Competitive Renewable Energy Zone (CREZ) boundaries in the desert areas of Kern, Los Angeles, San Bernardino, Inyo, Riverside, Imperial and San Diego counties. The Energy Commission website: http://www.energy.ca.gov/reti/documents/index.html includes maps and reports that locate the transmission corridors and CREZ boundaries within the desert region.

Figure 1: Desert Region Boundary

Desert Renewable Energy Resources

Renewable energy resources constantly renew themselves or are regarded as practically inexhaustible. In the desert region the renewable energy resources of interest include solar, wind, geothermal and biomass.

Renewable energy projects addressed in this manual include 1) energy development technologies eligible for RPS certification by the State of California, 2) such projects that are utility or large scale energy generation, geothermal extraction, digester, biogas, and biofuel refining facilities and 3) the associated roads, construction lay down areas, pipelines, geothermal wells, steam lines, and transmission lines to the first point of interconnection with the electric transmission system.

All utility-scale renewable energy electrical generation projects include facilities that convert the energy source to electricity (power plant) and facilities that distribute the electricity to the electrical transmission system. Power plant facilities include the energy resource collection or storage, electricity generators, and when applicable, facilities and equipment needed for cooling the generators. These facilities differ in design depending on the type of renewable energy resource proposed for use. Appendix B: Desert Renewable Energy Facility

Technologies provides brief descriptions of the renewable energy technologies addressed in this manual.

It is possible and in some cases likely, that solar and other types of renewable energy power plants will be proposed in conjunction with fossil fuel (most likely natural gas) fired power plants. The guidance and BMPs in this manual address hybrid-fueled power plants. For the plants to be eligible for RPS certification, the fossil fueled portion of the plant cannot exceed 5 percent of all fuels used, as measured on an annual energy input basis. For multi-fuel facilities that exceed the fossil fuel mix threshold, the Energy Commission may certify the renewable portion of the generation, only, as RPS eligible. For more information refer to the *Renewables Portfolio Standard Eligibility Commission Guidebook*, Third Edition (CEC-300-2007-006-ED3-CMF).

Organization of the Manual

Chapter 1 offers pre-application filing guidance to consider for timely processing of Energy Commission applications for certification (AFCs), BLM right-of-way (ROW) grants, environmental review under NEPA and CEQA, other federal, Tribal, state and local government permit / approval applications, and environmental review for desert renewable energy facilities. The project developer and agency pre-application filing actions may be of utmost importance as they will dictate whether the project applications can be processed in an accelerated manner. The pre-application process begins and sets the tone for 1) project developer, agency and stakeholder working relationships and 2) the subsequent phases of project development within which the parties will address issues and agree on impacts / appropriate mitigation, and / or project design changes.

Chapter 2 recommends BMPs for the facility post-application phases applicable to proposed desert renewable energy facilities, in general. Chapter 3 provides additional BMPs specific to solar, wind, geothermal and biomass energy technologies. Reviewing and becoming familiar with the BMPs during the pre-application phase will likely provide guidance for a) determining which pre-application actions are most appropriate for a particular project and b) carrying out those actions. The chapters are followed by a reference section, a glossary and list of acronyms, and appendices.

The pre-application actions guidance and BMPs are generally organized under the following technical disciplines:

- Air Quality
- Biological Resources
- Cultural and Historic Resources
- Electricity Transmission
- Hazardous Materials, Pesticides, and Waste Management
- Land Use / Agriculture
- Noise and Vibration
- Paleontological Resources
- Safety, Health and Nuisances
- Soils, Drainage, Erosion, Stormwater and Flooding
- Traffic and Transportation
- Visual Resources
- Water Supply and Quality

Chapter 1: Pre-Application Filing Guidance

Ideally, for projects to be permitted consistent with the Executive and Secretarial orders, and the RPS guidelines, renewable energy developers should complete the following critical actions before they file applications with BLM, the Energy Commission and other lead agencies. The actions are essential for the efficient and expedient processing of applications for renewable energy projects and summarize the guidance recommended in this chapter.

1) The renewable energy project is proposed to be located on land identified by REAT that is suitable for renewable energy development. The REAT is expected to identify draft study areas by January 2010.

2) The project will not use fresh ground water or surface water for power plant cooling.

3) The appropriate biological resource surveys have been completed using the proper protocols during the appropriate season.

4) A draft biological assessment (BA), if required for the project, has been tentatively approved by FWS, DFG and the appropriate lead agencies. The draft BA must include a complete draft project description, full description and assessment of project impacts and species affected, and project impact mitigation measures that have been reviewed by the appropriate agencies.

5) The appropriate cultural resource surveys, assessments, and project impact mitigation measures have been completed following the proper protocols and standards.

6) Ensure that all BLM requirements and Resource Management Plans (RMPs) have been addressed and incorporated in the project design, for projects located on BLM managed lands. Projects should be consistent with guidance in the BLM programmatic wind and geothermal Environmental Impact Statements (EISs), and after publication, the BLM programmatic solar EIS.

7) All the requirements of the local agency jurisdiction have been incorporated into the applications including but not limited to local zoning, general plan policies, land use, traffic, and height restrictions. The project will not be located on lands under a Williamson Act contract, require a zoning change, or General Plan amendment.

8) All of the requirements of the Department of Defense (DOD) and nearby military installations have been addressed and incorporated into a project's design.

9) The project site does not negatively impact ongoing transmission corridor planning. A transmission system interconnection study has been completed by the California Independent System Operator (CAISO) or other control area operator with measures identified and agreed upon that would eliminate any unacceptable degradation to the reliability of the transmission system beyond the first point of interconnection.

10) A power purchase agreement has been executed for the proposed project.

11) A preliminary Determination of Compliance is included with project applications to appropriate lead agencies, if a project will likely create air emissions during construction or operation.

A project developer's failure to address and resolve readily known and predictable issues associated with a project before applications are filed will likely require additional time for the permitting agency to process the application. To assist the agencies in facilitating the permitting process, project developers should identify and address readily known and predictable issues. They should propose appropriate project design features and mitigation as part of an AFC to the Energy Commission, a ROW application to BLM, and an application with another appropriate lead agency (such as the U.S. Environmental Protection Agency [USEPA], California State Lands Commission [SLC] or local government). If any items applicable to a project are not completed or the project is changed or modified after applications are filed, significant delays in the processing of an application are likely and would hinder the ability of the BLM, Energy Commission, FWS, DFG, and possibly other agencies, to process permits in a timely manner. Thus, early identification of impacts / mitigation measures and continuous coordination with appropriate regulatory agencies is advised to reduce permitting / approval timeframes.

The following guidance is offered for project developers and regulatory agencies to consider when developing a project, preparing and reviewing an application. They do not supplant the Energy Commission's data adequacy filing requirements, the filing requirements of the BLM and possibly other lead agencies, and requirements to initiate state and federal Endangered Species Act consultation with FWS and DFG.

The individual activities are numbered to facilitate review and discussion. The numbering sequence does not indicate the priority or importance of any particular activity.

General Pre-Application Activity Guidance

Early coordination with and responsiveness to the appropriate permitting agencies and stakeholders during project development can significantly reduce permitting / decision-making timeframes. Initiation of a regulatory process for a desert renewable energy project begins by meeting with federal, state, and local agency staff that regulate activities affecting environmental, community, and military resources. Meetings are generally most productive if the project scope is defined well enough to address the following issues:

- determine the permits and approvals needed for construction and operation of proposed renewable energy projects;
- agency decision-making history of similar projects or important precedents;
- identification of major stakeholder groups;
- types of issues likely to be raised by agencies and stakeholders;
- sequencing of permit applications and scheduling environmental review and decision-making processes.

Although the following guidance suggests when to initiate meetings, it is recommended discussions with federal, state, and local regulatory agencies be ongoing to provide updates on changes in project design and agency procedures, reach agreement on studies / surveys needed and maintain a realistic permitting schedule. Project developers should:

1) Identify the appropriate lead agencies for the proposed project. For example, the Energy Commission, BLM, SLC or a local government may be the lead agency or agencies depending on the renewable energy project size, location and technology.

2) Initiate discussions with the transmission-owning utility with which the proposed project will interconnect at least 24 months prior to filing applications with the lead agencies.

3) Initiate discussions with the CAISO or other applicable transmission control agency at least 18 months before filing an application with the Energy Commission, BLM or other lead agencies.

4) Initiate prefiling meetings with the Energy Commission at least 12 months before filing an AFC.

5) Initiate meetings with BLM at least 12 months before filing an application for ROW with BLM.

6) Initiate prefiling meetings with other lead agencies, as appropriate, at least 12 months before filing an application.

7) Initiate discussions with FWS and DFG at least 12 months before filing power plant applications with the Energy Commission and BLM; include BLM and Energy Commission in the discussions.

8) Initiate meetings with applicable and appropriate local government offices, for example city and county departments of environmental health and/or protection, fire departments, building or planning departments 12 months in advance of filing applications with the lead agencies.

9) If appropriate, meet with the Governor's Office of Planning and Research for information on the Military Land Use Compatibility Analyst, the State Clearinghouse, and/or CEQA Guidelines.

10) Initiate discussions with the U.S. Army Corps of Engineers (ACOE) at least 12 months in advance of filing applications with lead agencies to determine permitting requirements.

11) Initiate meetings with the DOD and/or the appropriate or nearby military installation at least 12 months in advance of filing lead agency applications. Include a letter from the DOD with the applications stating the project would not conflict with military operations.

12) Initiate meetings with the State Office of Historic Preservation (SHPO) at least 12 months prior to filing an application to initiate consultation on potential cultural resource issues.

13) Initiate meetings and consult with the applicable Regional Water Quality Control Board (RWQCB) at least six months prior to filing an application to determine which project activities would be regulated and require permits from the regional water board.

14) Initiate meetings with the State Department of Environmental Health & Environmental Protection and Federal Emergency Management Agency (FEMA) to determine their applicable permitting requirements. Schedule the meetings six months prior to submitting applications to lead agencies.

15) Meet with interested community and environmental groups at least six months prior to filing applications with the appropriate lead agencies to involve the leaders of the community at the early stages of project planning and development to inform them of the project and its potential benefits and impacts. Obtain stakeholder input and begin

identifying issues. This will be an ongoing process over time and is likely to result in a series of meetings. Activities to consider include:

a) consulting the community on the location of the energy facility to incorporate community values into design, as feasible and appropriate;

b) conducting educational presentations at public meetings that include information on facility design and operation and how projects can fit in with the community;

c) making commitments to hire workers from the community for construction and operation personnel;

d) building financial assistance to community projects into the project's business plan to help gain community support.

When developing applications for appropriate lead agencies, list the organizations and groups consulted, summarize their comments and concerns, and describe what has been done to address these concerns.

Technical Disciplines

Project developers should conduct the following activities to address environmental resource related issues that generally arise during agency review of permit applications for proposed construction and operation of renewable energy projects. It is likely that all measures may not be applicable to any single proposed facility. The proposed facility technology, location, and design, in addition to applicable agencies and their requirements will determine the appropriate activities for a particular project. Following these resource topics are activities recommended for specific renewable energy technologies.

Air Quality

1) Determine the applicable air quality management district.

2) Determine if the facility site is within a federal and / or state nonattainment ambient air quality standard area for any criteria air pollutant.

3) Gather ambient air quality data early in the exploration phase and the planning phases of well field and power plant design. Use standard and well established procedures for assessing air quality impacts. Gather meteorological data or establish a meteorological station (to collect at least one year of data) using siting and operational criteria for these stations.

4) Document background or baseline air quality conditions. Site-specific monitoring provides the most definitive baseline data. Collect or monitor routine and periodic samples over the course of at least one year.

5) Document physical parameters of emission sources and of local topography and nearby structures.

6) If cooling towers are proposed, use USEPA approved computer model(s) to calculate cooling tower plume dimensions and plume drift (dissolved chemicals – salts, toxic compounds, and biocides – in large water droplets) for meteorological conditions and cooling tower characteristics.

7) Use the air dispersion models (e.g., AERMOD or SCREEN) to predict atmospheric impacts from emissions sources and fugitive dust. Run models using on-site or representative meteorological data representing at least one year of data. Use models

to assess and reduce predicted impacts to sensitive receptors (e.g., minor changes to stack dimensions, orientation, discharge point locations, and alternative well pad and power plant sites). Publish results in an executive summary and in tables that compare results with regulatory thresholds.

8) Obtain emissions inventory data from existing facilities with similar technology to the proposed project.

9) Include in project designs locations of source-testing sampling monitors.

10) Consider prevailing wind directions and the nearest sensitive receptors when planning the configuration of the power plant facility and location of cooling towers.

11) For emissions of criteria pollutants in non-attainment areas and depending on attainment status, provide a detailed list of the offsets / mitigation that could be purchased / secured to offset / mitigate the emissions so there are no net emission increases attributed to facility operations. Include emissions associated with mirror washing at solar power plants, fuel transport and preparation, delivery of consumables, and other operations associated with the operation of the project.

12) Include the proposed project application for a local air quality management district determination of compliance or authority to construct with applications to the lead agencies. Ideally, for more timely review of applications include the draft determination of compliance.

13) For new emission sources to be located on Federal land, 40 CFR Ch.1 Subpart B states that "[n]o department agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit or approve any activity that does not conform to an applicable implementation plan." Include direct and indirect emissions from new emission sources when demonstrating conformity with the applicable implementation plan. Since the timeline to obtain a finding of conformity can take over a year, the applicant should include the conformity finding from the appropriate federal land manager with the AFC.

Biological Resources

There are a number of special-status biological resources that exist in the desert and require consideration early in the site selection and evaluation process. It is important to discuss the project and potentially affected plant and animal species and habitats with agencies and local governments early in the project planning and development process to consider specific protocols that may require a year (or more) study prior to the start of the formal regulatory process.

1) Meet with FWS, DFG and the appropriate lead agencies to identify potential issues, species that could be impacted, including special-status species and unique plant assemblages that could occur in the project area (including those areas that could be directly and indirectly impacted by the project), designated critical habitat, protocol survey procedures, mitigation measures and expectations, desert tortoise translocation, burrowing owl translocation, and the contents of an agency tentatively approved BA. Appendix D: Biological Resource Survey and Assessment Guidance includes Energy Commission, BLM and FWS recommended wildlife and plant field survey guidance. Consider the survey guidance for any renewable energy project addressed in this document. Regarding mitigation of impacts to listed species, project developers should discuss with FWS and DFG approaches for developing a more comprehensive conservation strategy than merely acquiring and managing land.

2) Meet with applicable local governments to determine whether the site contains locally protected trees and shrubs.

3) Design and site the project, in consultation with permitting agencies, to avoid or minimize impacts to sensitive and unique habitats and wildlife species (e.g., locate energy generation facilities, roads, transmission lines and ancillary facilities in the least environmentally sensitive areas; i.e., away from riparian habitats, streams, wetlands, vernal pools, drainages, critical wildlife habitats, wildlife conservation, management, other protected areas, or unique plant assemblages). For example:

   a) Design transmission line poles, access roads, pulling sites and storage and parking areas to avoid special-status species or unique plant assemblages adjacent to linear facilities.

   b) Locate and/or design facilities to minimize or mitigate for disruptions to wildlife movement.

   c) Design facilities to discourage their use as perching or nesting substrates by birds.

   d) Design facility lighting to prevent side casting of light towards wildlife habitat. Design lighting to prevent skyward projection of lighting that may disorient night-migrating birds.

   e) Avoid using or degrading high value or large intact habitat areas, such as Joshua tree woodlands and/or as identified in state wildlife action plans.

   f) Avoid severing movement and connectivity corridors and daily movement areas and consider existing conservation investments such as protected areas and lands held in trust for conservation purposes.

   g) Locate facilities in an area that does not disrupt sand transport processes nor removes some or all of a sand source relative to nearby sand dune systems harboring listed or otherwise sensitive species. Projects should not armor sand sources for nearby dune systems.

4) Submit survey protocols to FWS, DFG and appropriate lead agencies for review, comment, and approval. Surveys and inventories of special-status species should follow protocols recognized by FWD, DFG and appropriate lead agencies. Also, to ensure the quality of the protocol surveys, the names and qualifications of the surveyors should be provided to FWS, DFG and the lead agencies for review two weeks prior to initiating surveys.

5) Complete all biological resource surveys according to the approved survey protocols during the appropriate season and provide a FWS-approved BA and approval letters in applications to the appropriate lead agencies. The approved BA must include a complete description of the project, thorough discussion of the species and habitats, identification of the biological resource impacts, and all recommended mitigation measures to avoid and address expected impacts.

6) Meet all requirements and conditions of existing Natural Community Conservation Plans/Habitat Conservation Plans if a project is to be located within an area covered by the conservation plans (such as the Coachella Valley area of Riverside County).

7) Complete all wetlands delineations for waters of the state and US and provide verification in the AFC that the wetlands delineations are acceptable to the appropriate state (DFG) and federal (ACOE) regulatory agencies.

8) Provide, in the applications to lead agencies, a draft plan of how the hydrologic functions and biological resource values will be achieved if any creek, wash, or other waters will be rerouted as part of the project.

9) In applications to appropriate lead agencies, provide copies of the completed and, when applicable, DFG-approved application(s) for an Incidental Take Permit and Streambed Alteration Agreement, if DFG has indicated one or both will be required.

10) Include a draft common raven (*Corvus corax*) management plan for the project site in applications to appropriate lead agencies, provide verification that agency consultation occurred during development of the draft raven management plan, and acknowledge concurrence with it for offsite raven management. The FWS will likely require that the project-specific plan be consistent with the most current FWS-approved guidelines and uses adaptive management strategies. The plan should be implemented for the life of the project and include management strategies to control and limit common raven abundance through implementation of construction and operation practices that avoid creating favorable conditions for common ravens (feeding, watering, nesting, roosting, and perching) and provide regular common raven nest removal from project structures.

    A raven management plan should be developed in coordination with the FWS, DFG and the appropriate lead agencies. The goal of the plan should be to ensure that the project does not attract common ravens. The plan should specify:

    a) passive design strategies (including the use of repellant devices to discourage nesting, perching, and roosting on project facilities,, including transmission poles and towers);

    b) a refuse management system;

    c) a monitoring program;

    d) reporting requirements; and

    e) adaptive management options that would be applied if needed, including the removal of all common raven nests.

10) Use of evaporation ponds should be avoided where the water would be considered toxic to birds and other wildlife. If evaporation ponds are anticipated for wastewater disposal, include a complete description of the ponds and justify the need for them in applications to lead agencies. A complete evaporation pond description should include the pond acreage, depth, slope of the pond sides, and capacity of each pond. Also describe how often water is likely to stand in the pond(s) and all proposed pond design features to be implemented to discourage their use by birds and other wildlife. Identify the projected water quality and toxicity of the evaporation pond and its potential to harm or impact any form of wildlife. Describe what would be considered a threat and potential strategies to be employed if it is determined that the ponds do pose a threat to wildlife.

11) If evaporation ponds are included in the project design, discuss and analyze alternatives (environmental and economic alternatives) to the evaporation ponds including using modern and cost effective zero liquid discharge (ZLD) technologies.

12) Consult with FWS and DFG to determine the need for and/or feasibility of conducting desert tortoise translocation to lessen or mitigate project impacts, if desert tortoises are observed within the proposed project area. Development and implementation of a translocation plan may require, but not be limited to: additional surveys of potential

recipient sites; disease testing and health assessments of translocated and resident tortoises; monitoring protocols; and consideration of climatic conditions at the time of translocation. Because of the potential magnitude of the impacts to desert tortoises from proposed renewable energy projects, FWS and DFG must evaluate translocation efforts on a project by project basis in the context of cumulative effects.

13) After completion of special status plant surveys, include a draft plant mitigation plan (as applicable) in applications to appropriate lead agencies that contains scientifically supportable recommendations on how impacts to special status plant species would be mitigated.

14) If wildlife species, such as the burrowing owl, will need to be translocated prior to project construction, develop a draft translocation plan and provide the draft plan in applications to appropriate lead agencies. The draft plan must be developed in consultation with DFG and FWS. Request an outline or copy of a previously approved plan from FWS to use as an example.

15) Provide a draft habitat compensation plan, when deemed appropriate by the fish and wildlife agencies, which describes the acquisition schedule relative to expected project groundbreaking, endowment funding strategy and amount so that adequate funds will be available to fund the management of the compensation lands in perpetuity. Identify the location and suggested amount of compensation habitat and the rationale for the suggested habitat compensation location(s).

16) Include a complete description of the proposed funding mechanism to address facility closure and habitat restoration in applications to appropriate lead agencies. The funding strategy should guarantee that sufficient financial resources will be available to cover all the costs of project removal and the successful restoration of the project site habitat.

Cultural and Historical Resources

The following guidance is recommended for development of Cultural Resources Monitoring and Mitigation Plans (CRMMPs)under Section 106 of the National Historic Preservation Act (16 USC 470f) and for comprehensive impact assessments by lead agencies.

1) Retain the services of a cultural resources specialist with training and background that conforms to the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 CFR Part 61).

2) Seek guidance from the state and federal lead agencies, as appropriate, for coordination of Nation-to-Nation consultations with the Native American Tribes.

3) Consult with lead agencies early in the planning process to identify the potential presence of cultural properties. The agencies will provide the project developer with specific instruction on policies for compliance with the various laws and regulations governing cultural resources management, including coordination with regulatory agencies and Native American Tribes.

4) Define the area of potential effect (APE), which is the area within which project construction and operation may directly or indirectly cause alterations in the character or use of historic properties. The APE should include a reasonable construction buffer zone and laydown areas, access roads, and borrow areas, as well as a reasonable assessment of areas subject to effects from visual, auditory, or atmospheric impacts, or impacts from increased access.

5) Conduct a records and literature search for archeological sites and historic properties using resources from appropriate agencies, the regional Archeological Information Centers (e.g. San Bernardino County Museum or the Archaeological Research Unit at the University of California, Riverside) as well as local museums and libraries. Depending on the extent and reliability of existing information, an archaeological survey may be required.

6) Rely on the cultural resources specialist's expertise in choosing a site that avoids areas of exceptional historic value. The specialist will provide a report to the appropriate lead agencies that determines the presence or absence of archeological sites, traditional cultural properties, and historic properties in the APE. State and federal agencies, as appropriate, will evaluate cultural and historical survey results for eligibility of sites for listing on the National Register of Historic Places.

Electricity Transmission

In applications to appropriate lead agencies, provide a copy of the electric transmission interconnection study and the approval by the CAISO or the appropriate control agency. This study should be approved by the CAISO or the appropriate control area agency prior to filing of the lead agency application. The interconnection study should include an identification of the transmission impacts beyond the first point of interconnection and acceptable measures to mitigate/alleviate impacts to the system. When more than one alternative mitigation measure is identified, the applications should indicate the measure selected by the project developer. For each selected mitigation measure an environmental analysis sufficient to meet the CEQA requirements for indirect project impacts should be provided.

Hazardous Materials, Pesticides and Waste Management

1) Conduct a Phase I site assessment (ASTM E1527 or other equivalent assessment method deemed acceptable by the appropriate regulatory oversight agency) for the project site and linear appurtenances to determine whether there are any environmental concerns. If Phase I identifies conditions, concerns, or data gaps requiring additional site assessment to adequately characterize the site, then additional site assessment work (i.e. Phase 2) should be conducted with appropriate regulatory agency oversight. Provide the Phase I, and if conducted, the Phase 2 site assessment with applications to appropriate lead agencies.

2) Where a site may be contaminated or classified as a "brownfield" site, consult with state and local agencies (Department of Toxic Substance Control, RWQCB, or designated local agencies) that would regulate remediation and development activities. Ensure that any necessary remediation will be conducted in accordance with an approved remedial action plan.

3) Design project facilities and operations to minimize spills to lessen frequency and intensity of accidents.

Land Use/ Agriculture

1) Provide proof of project site control or ownership (legal documentation).

2) Consider use of degraded lands, to the extent feasible, for development of renewable energy facilities.

3) Design the project to comply with all applicable federal, state and local laws, ordinances, regulations and standards including the Subdivision Map Act, California Land Conservation Act, and local permitting requirements.

4) On privately-owned lands, assess the impacts of the proposed project on agriculture, farmland, and grazing operations through use of the California Agricultural Land Evaluation and Site Assessment model. Develop feasible measures to reduce the significance of impacts. Project developers should avoid when possible, the conversion of Prime Farmland, Unique Farmland or farmland of Statewide Importance, or lands under a current Williamson Act contract.

5) A project on agriculture land under a Williamson Act contract will significantly delay the siting process as the contract must be terminated by the land owner and the county following prescribed steps and lengthy time frames. Projects, including transmission lines to the first point of interconnection with the existing electric transmission system, on Williamson Act land cannot be processed in an expedient manner.

6) Meet with local agencies and elected officials before filing permit or approval applications to ensure that the project is to be located on land zoned appropriately with no zoning, land use, or height restrictions. Include a statement from the local agency and the governing body that they have reviewed the proposed project and that it would be consistent with General Plan, zoning ordinances, and height restrictions. If a conditional use permit is required by the local agency, include a copy of the conditional use permit application with applications to lead agencies. Processing of applications for projects requiring land use designation changes will likely be delayed.

7) Consult the Office of Planning and Research mapping tool to identify whether their proposed project is located in the vicinity of military bases and military airspace. This mapping tool will help developers comply with legislation that requires the military to be notified of certain development applications and general plan actions. This mapping tool is available on the internet at http://sample1.casil.ucdavis.edu/Calmap8/.

8) DOD entities request early notification with the military on proposed energy development to provide an opportunity for DOD to address potential concerns with the proposed energy development project as it may relate to current and future military testing and training missions to include, but not limited to: Military Operating Areas; Military Training Routes; air space; Special Use Airspace; airfield surfaces; Terminal Operations; air and ground safety operations; Remote Support Sites (radars, microwaves and communications towers); and installation access.

9) If the BLM Resource Management Plan must be amended, include a completed BLM application.

10) Provide U.S. Census Bureau data to determine whether the facility would be located within a two-mile radius of a minority population or a population where fifty percent or more of the residents have an income below the poverty level.

11) Ensure the proposed facility site contains adequate area for construction laydown and staging, parking for construction and operation worker vehicles and site traffic circulation aisles).

Noise and Vibration

1) Consider locating facilities more than 0.5 mile from sensitive noise receptors, including quiet recreation, churches, medical care facilities, schools, child care facilities, parks, residences, wildlife/wilderness areas.

2) Take measurements to assess the existing background noise levels at a given site and compare them with the anticipated noise levels associated with the proposed project.

3) Prepare a noise monitoring and mitigation plan. The project should be designed to a) minimize noise impacts to sensitive noise receptors and limit increases to less than significant levels (no more than a five to 10 dBA increase above ambient levels) and b) not exceed local noise standards. Generally in the event project-related noise would cause a potentially significant impact, the developers should mitigate those impacts to the extent feasible. Consider acquiring lands to serve as buffers around the proposed facilities.

Paleontological Resources

1) Retain the services of a paleontological resources specialist with training and background that conforms with the minimum qualifications for a vertebrate paleontologist as described in *Measures for Assessment and Mitigation of Adverse Impacts to Non-Renewable Paleontologic Resources: Standard Procedures*, Society of Vertebrate Paleontology, 1995 http://www.vertpaleo.org/society/polstateconfomimpactmigig.cfm.

2) Conduct an initial scoping assessment to determine whether proposed construction activities would disturb formations that may contain important paleontological resources. Whenever possible potential impacts to paleontological resources should be avoided by moving the site of construction or removing or reducing the need for surface disturbance. The scoping assessment should be conducted by the qualified paleontological resources specialist in accordance with applicable agency requirements.[1]

3) The project developer's qualified paleontological resources specialist should determine whether paleontological resources would likely be disturbed in a project area on the basis of the sedimentary context of the area and a records search for past paleontological finds in the area. The assessment may suggest areas of high known potential for containing resources. If the assessment is inconclusive a surface survey is recommended to determine the fossilferous potential and extent of the pertinent sedimentary units within the project site. If the site contains areas of high potential for significant paleontological resources and avoidance is not possible, prepare a paleontological resources management and mitigation plan that addresses the following steps:

   a) a preliminary survey (if not conducted earlier) and surface salvage prior to construction;

   b) physical and administrative protective measures and protocols such as halting work, to be implemented in the event of fossil discoveries;

   c) monitoring and salvage during excavation;

   d) specimen preparation;

   e) identification, cataloging, curation and storage; and

   f) a final report of the findings and their significance.

3) Choose a site that avoids areas of special scientific value.

[1] The Paleontological Resources Protection Act of 2009 provides criminal penalties for persons who "excavate, remove, damage, or otherwise alter or deface any paleontological resources located on Federal lands" unless the resources (fossils) are collecting in accordance with the Act. The Act charges the Secretary of the Interior with promulgating regulations to carry out the Act.

Safety, Health and Nuisances

1) Contact the local fire protection district or if necessary, California Department of Forestry and Fire Protection (CALFIRE, Office of the State Fire Marshall) to locate the proposed project site relative to fire hazard severity zones. Determine whether the site would be located in a fire hazard severity zone within State Responsibility Areas, a Local Agency Very High Fire Hazard Severity Zone or a Wildland-Urban Interface Fire Area. Address related local agency fire protection building standards.

2) Survey project sites for unexploded ordnance, especially if projects are within 20 miles of a current DOD installation or formally used defense site.

3) Establish setbacks or consider acquiring buffer lands to separate nearby residences and occupied buildings from the proposed facility to minimize impacts from sun reflection, low-frequency sound, or electromagnetic fields (EMF), construction and operation noise, air pollution and facility related hazards and wastes.

4) Design the project to reduce electromagnetic interference (EMI) (e.g., impacts to radar, microwave, television, and radio transmissions) and comply with Federal Communications Commission (FCC) regulations. Signal strength studies should be conducted when proposed locations have the potential to affect FCC licensed transmissions. Potential or real interference with public safety communication systems (e.g., radio traffic related to emergency activities) or the amateur radio bands should be reduced to nil.

Soils, Drainage, Erosion, Stormwater, Flooding

1) Conduct soil surveys to identify soil types and the typical silt content of soils in many locations.

2) Use soil samples for chemical analysis of the less than 400 mesh size fractions (less than 38 microns) to approximate the chemical make-up of the suspendable fraction of road dust and soil. (This measurement indicates whether toxic metals can be transported with this fugitive dust.)

3) Use computer-model predictions of fugitive dust to evaluate various control scenarios (for example, watering, soil stabilizers, vehicle speed limits).

4) Provide a complete site grading plan, and drainage, erosion, and sediment control plan with applications to applicable lead agencies. Avoid locating facilities on steep slopes, in alluvial fans and other areas prone to landslides or flash floods, or with gullies or washes, as much as possible.

5) Submit a draft Notice of Intent and a draft Storm Water Pollution Prevention Plan (SWPPP) to the State Water Resources Control Board (SWRCB) or RWQCB for advance review. Ensure the SWPPP is prepared by a qualified SWPPP Developer. If the proposed project will be subject to the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Construction Permit), ensure the plan addresses the latest SWRCB requirements and is submitted to the SWRCB. As the state's storm water program develops the RWQCBs may issue general permits or individual permits containing more specific permit provisions. Consider addressing the following topics in the draft SWPPP:

    a) vicinity map;

b) site delineation including location of watercourses and other critical drainage/erosion areas relative to proposed project construction, laydown and landscape, transmission and pipeline corridor areas;

c) drainage map and measures;

d) clearing and grading plans, including material to be excavated and used for fill;

e) best management practices plan and description of erosion and sediment control practices.

6) Evaluate flood zoning and determine whether the site is located within a Flood Hazard Zone and/or the development would result in flood plain modifications. Determine 100 year floodplain potential at the project location and avoid areas prone to flooding, as appropriate. If the project will modify the flood plain, submit an application to FEMA or county requesting map revisions. Include the completed application with applications to appropriate lead agencies.

7) Provide a completed permit application to the appropriate local jurisdiction for a drainage and flood control permit with applications to appropriate lead agencies.

8) Consult with the appropriate RWQCB for any Clean Water Act (CWA) Section 401 Water Quality Certifications necessary for wetlands impacts and CWA Section 404 dredge and fill permits.

Traffic and Transportation

Roads

1) Minimize the number and length of access, internal, service and maintenance roads; use existing roads when feasible. To the extent possible, avoid use of traffic routes that cross BLM-designated Open Routes of Travel.

2) Provide for safe ingress and egress to/from the proposed project site. Identify road design requirements for any proposed private and state roads, and related road improvements (such as highway widening and installation of stacking lanes), in coordination with applicable local and state transportation agencies.

3) If new roads are necessary prepare a road siting plan and consult standards contained in *BLM 9113 Manual* (http://www.oilandgasbmps.org/docs/GEN96-9113.pdf) and/or state and local requirements. The plans should include design and construction protocols to ensure roads will meet the appropriate standard and be no larger than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Access roads should be located to avoid or minimize impacts to washes and stream crossings, follow natural contours and minimize side-hill cuts. Roads internal to a project site should be designed to minimize ground disturbance. Excessive grades on roads, road embankments, ditches, and drainages should be avoided, especially in areas with erodible soils.

4) Prepare a traffic management plan to ensure that hazards would be eliminated or minimized from the increased truck traffic and that traffic flow would not be adversely impacted. *BLM 9113 Manual* and the *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (revised 2007) provide standards for development on federal lands. For portions of plans addressing state and local roads use applicable state and local guidance and standards. Issues such as location of school bus routes, stops, and schedule should be identified and addressed in the traffic management plan. The plan should consider:

a) proximity (within 1,500 feet) to congested roads, hazardous road design features,

b) siting exits / entrances with clear views (at least 200 feet in either direction) of access roads,

c) whether construction / operation related traffic will lower the level of service on public streets within a one mile radius of the facility site.

State whether access roads need to be built or existing roads are most appropriate for transporting building materials and heavy-duty equipment. To address identified road hazards, incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration.

5) If railroad crossings need improvements to provide for safe crossing, consult with the appropriate railroad and the California Public Utilities Commission (CPUC) for permitting requirements.

Aviation

1) Meet with the local Airport Land Use Commission. In applications to appropriate lead agencies, provide a copy of a letter stating that the proposed project is compatible with the Airport Land Use Compatibility Plan. The following locations and design features may contribute to a decision that the facility is incompatible with operations of a nearby airport:

a) Siting the facility within 20,000 feet (3.8 miles) of a runway that is at least 3,200 feet in actual length, or 5,000 feet from a heliport.

b) Locating any portion of a facility within a designated airport safety zone, airport influence area or airport referral area.

c) Introducing a thermal plume, visible plume, glare, or electrical interference into navigable airspace on or near an airport.

d) Proposing a structure that will exceed 200 feet in height above ground level.

2) Consult with the Federal Aviation Administration (FAA) to inform the Administration of the heights of the project structures and avoid conflicts with aviation. Design the project to comply with FAA regulations, including lighting regulations, and to avoid potential safety issues associated with proximity to airports or landing strips.

3) Complete FAA Form 7460, provide to FAA and include a copy in applications to appropriate lead agencies.

4) Consult with representatives from the appropriate military installation for projects to be located under aircraft low fly zones. Design the project to address military concerns.

Visual Resources

1) Consider, as early as possible, visual resources in the project planning and siting phase. A professional landscape architect should be a part of the planning team evaluating visual resource issues as project siting options are considered.

2) Utilize, as appropriate, digital terrain mapping tools at a landscape-viewshed scale for site planning and design, visual impact analysis, and visual impact mitigation planning and design. The digital terrain mapping tools should be at a resolution and

contour interval suitable for site design and accurate placement of proposed developments into the digital viewshed.

3) Perform visual mitigation planning and design through field assessments, applied global positioning system technology, photo documentation, use of computer-aided design and development software, and visual simulations.

4) Evaluate the potential visual impacts on National Historic Trails that could be impacted by the proposed project and identify appropriate mitigation measures. A Trail may be impacted if the project site includes remnants of a National Historic Trail, is located within the viewshed of a Trail's designated centerline, or includes or is within the viewshed of a trail eligible for listing on the NRHP.

5) Because the landscape setting observed from national historic sites, national trails, and Tribal cultural resources may be a part of the historic context contributing to the historic significance of the site or trail, project siting should avoid locating facilities that would alter the visual setting such that they would reduce the historic significance or function.

6) Facilities proposed within 0.25 miles of National Scenic Highways and All-American Roads should include measures to minimize the profile of all structures related to the facility so that the viewshed from the scenic highway is preserved. The project developer should evaluate the potential visual impacts on National Scenic Highways and All-American Roads associated with the proposed project and identify appropriate mitigation measures.

7) "Skylining" of transmission and other structures should be avoided; that is, they should not be placed on ridgelines, summits, or other locations where they would be silhouetted against the sky from important viewing locations. Siting should take advantage of opportunities to use topography as a backdrop for views of facilities and structures to avoid skylining.

8) Site projects away from prominent landscape features (e.g., buttes), where possible.

9) Siting of linear features should follow natural land contours rather than straight lines, particularly up slopes.

10) Siting should take advantage of both topography and vegetation as screening devices to restrict views of projects from visually sensitive areas. Where screening topography and vegetation are absent, natural-looking earthwork berms and vegetative or architectural screening should be used.

11) Minimize the number of structures. Activities should be combined and carried out in one structure, or structures should be co-located to share pads, fences, access roads, lighting, etc.

12) The siting and design of facilities, structures, roads, and other project elements should match and repeat the form, line, color, and texture of the existing landscape.

13) Low-profile structures should be chosen whenever possible to reduce their visibility.

14) Design and locate structures and roads to minimize and balance cuts and fills. Reducing cuts and fills has numerous visual benefits, including fewer fill piles, landform and vegetation that appears more natural, fewer or reduced color contrasts with disturbed soils, and reduced visual disturbance from erosion and the establishment of invasive species.

15) Grouped structures should all be painted the same color to reduce visual complexity and color contrast.

16) Consult with appropriate lead agencies for selection of key observation points and appropriate methodologies for analyzing visual effects of the proposed project. Consult with BLM on completion of Visual Resources Management designations, for projects to be located on BLM lands. Include the designations, where applicable, and visual resource analyses in applications to the appropriate lead agencies.

17) Consider the visual impacts of the proposed facilities and transmission lines, from all relevant viewing angles when selecting building sites and locations. Consider visual impacts from proposed cooling system frequent water vapor plumes if cooling towers are proposed.

18) Consider the landscape character when designing placement of facilities.

19) Prepare a Site Design and Lighting Plan. Site design elements should be integrated with the surrounding landscape. Elements to address include minimizing the profile of the ancillary structures, burying cables, prohibition of commercial symbols, and non-glare, non-reflective lighting. Regarding lighting, efforts should be made to minimize the need for and amount of lighting on ancillary structures. Project developers should design and commit to install all permanent exterior lighting such that (a) light fixtures do not cause spill light beyond the project site; (b) lighting does not cause reflected glare; (c) direct lighting does not illuminate the nighttime sky; (d) illumination of the project and its immediate vicinity is minimized by including use of motion detectors or other controls to have lights turned off unless needed for security or safety; (e) lighting complies with local policies and ordinances; and (f) use lighting that meets International Dark Sky Association standards, when feasible.

Water Supply and Quality

1) Design biomass-fueled, solar and geothermal power plants to use air-cooled technology or recycled/impaired water (no fresh groundwater or surface water) for cooling. If recycled water is proposed, provide a "will serve" letter from the water supplier and an approved agreement, a "will serve" letter and approved agreement to return the wastewater stream, and/or provide a plan for a zero liquid discharge (ZLD) system. If the water supply or waste water treatment services are to be supplied by a special district and the proposed project is to be located outside the service boundaries of the district, the Local Agency Formation Commission (LAFCo) will need to approve the annexation of the project to the district, or approve an "out of service area" contract to provide the services requested. If the supplier of water is a private water company, similar approvals will be required from the CPUC. Any proposed fresh groundwater or surface water use for cooling or any industrial other purpose including mirror washing would: a) require detailed analysis and b) would likely delay the permitting process.

2) For any planned use of water, identify the water sources, legal entitlements, water rights, adequacy of capacity to serve project demands while maintaining aquatic and riparian resources, quantity of water used for project construction and operational needs, and water discharges, including but not limited to construction, systems testing, process and cooling needs, and washing of mirrors.

3) Developers should also identify wastewater treatment and pre-treatment measures and new or expanded facilities, if any, to be included as part of the facility's NPDES.

4) Where use of recycled water is proposed, submit permit applications to the California Department of Public Health and RWQCB. Include the applications with applications to appropriate lead agencies.

5) If use of groundwater is proposed for industrial purposes other than power plant cooling, ensure a comprehensive analysis of the groundwater basin is provided and the following potential significant impacts are thoroughly evaluated. Address, as applicable, uses that would:

   a) exacerbate or create overdraft conditions,

   b) cause drawdown in adjacent wells,

   c) cause changes in water quality and effects other beneficial use,

   d) affect groundwater basins in adjacent areas and states, and/or

   e) affect other environmental resources such as springs providing water for plants and wildlife.

   Include adequate mitigation for potential impacts and analyze alternative water sources and technologies.

2) Where a groundwater well is proposed to be drilled or used, submit an application to the appropriate local jurisdiction for a permit. Include the application with applications to appropriate lead agencies and provide the following information:

   a) The legal description (township, range, section, and quarter section) of each proposed well to be used for the project, the anticipated pumped capacity of each well in gallons per minute, and the total withdrawal in acre-ft/year. The peak pumping rates anticipated during the project should be included. The location of the planned wells should be located on a suitable map within the area under application.

   b) The aquifer, the hydrogeologic characteristics of the aquifer, and the targeted production zone of the aquifer for all wells.

   c) Any known surface water resources (springs or streams) that may be affected by the proposed pumping, due to a hydraulic connection between surface and ground water.

   d) The potential cone of depression that might be caused by the proposed pumping. This could be done by use of an analytical model (for example, a well field simulation program such as THWELLS or by use of a numerical model such as MODFLOW). Also, identify the predicted extent and magnitude (in feet of water level drawdown) of the cone of depression after 10, 20 and 50 years of operation. Discuss the maximum drawdown expected during the life of the project.

   e) Alternative ways to meet water requirements for the project that would reduce the fresh water requirements. For example, use of dry cooling technology, or use of several concentration cycles for cooling water.

   f) Plans for monitoring ground water conditions during the life of the project, such as the use of nearby wells to monitor water levels. Monitoring should start early in the permitting process and a minimum of one year of data should be collected before any groundwater is withdrawn for the project.

3) If use of surface water is proposed for industrial purposes, ensure a comprehensive analysis of the supply is provided and the following potential significant impacts are evaluated and issues are addressed:

   a) potential impacts to other users or adjacent states,

   b) potential use that impacts water quality,

   c) potential use that impacts other water resources,

   d) potential use that impacts environmental resources, including protected wildlife and fishes,

   e) reliability of the water supply proposed for project use, and

   f) alternative water sources and technologies.

4) Where use of surface water is proposed for industrial purposes, provide a "will serve" and an approved water service agreement with applications to appropriate lead agencies. This may include approvals needed from LAFCo or the CPUC, as discussed above.

5) Design the project using ZLD technologies so that there is no offsite wastewater discharge.

6) Where it can be demonstrated to be infeasible to use ZLD technologies and deep well injection of wastewater disposal is proposed, submit an application to the USEPA. Include the completed application(s) with applications to appropriate lead agencies. Proposing deep-well injection is likely to delay permitting of the proposed project.

7) Where it can be demonstrated to be infeasible to use ZLD technologies and evaporation ponds are proposed for wastewater disposal, submit an application to the RWQCB. Include the completed application with applications to appropriate lead agencies. Proposing an evaporation pond is likely to delay permitting timeframes for the proposed project.

8) Where an on-site septic treatment system is proposed, submit a permit application to the appropriate local jurisdiction and include the application with applications to appropriate lead agencies.

Wind Energy Power Plant Guidance

In addition to considering the recommended activities above, project developers should refer to the volunteer *California Guidelines for Reducing Impacts to Birds and Bats From Wind Energy Development* (California Guidelines) (California Energy Commission and California Department of Fish and Game 2007). The executive summary is provided in *Best Management Practices & Guidance Manual: Desert Renewable Energy Projects,* Appendix E. The California Guidelines lead the developer through the steps addressing bird and bat impacts, and issues of concern with wind energy developments.

The California Guidelines are a science-based collaboration between the Energy Commission and DFG and provide information to help reduce impacts to birds and bats from new development or repowering of wind energy projects in California. They address the following topics:

Chapter 1: Preliminary Site Screening

Chapter 2: CEQA, Wildlife Protection Laws, and the Permitting Process

Chapter 3: Pre-Permitting Assessment

Chapter 4: Assessing Impacts and Selecting Measures for Mitigation

Chapter 5: Operations Monitoring and Reporting

The FWS has developed interim voluntary guidance intended to assist the wind energy industry in avoiding or minimizing impacts to wildlife and their habitats. The current guidance is available at http://www.fws.gov/habitatconservation/Service%20Interim%20Guidelines.pdf. The guidance is expected to be revised in 2010.

Geothermal Energy Power Plants

The activities listed in earlier sections of this chapter (with the exception of the Wind Energy Power Plant Guidance section directly above) are generally applicable to geothermal energy power plants. In addition, permit applications should be submitted and items specific to geothermal power plant technology should be considered and carried out prior to submitting applications to appropriate lead agencies.

1) Include the permit application to the Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR) for the geothermal test, production, and injection wells in applications to lead agencies.

2) Include a permit application to the local agency for the steam supply pipelines connecting the geothermal wells to the power plant facility in applications to lead agencies.

3) For binary plants, use USEPA developed protocols to estimate fugitive emissions of volatile organic compounds from valves and flanges.

4) Consider purchasing buffer areas, rights-of-way, and/or negotiating with public agencies to install road gates to address community, public access, noise, air quality and other issues/concerns.

5) Site geothermal wells and power plants downwind of population centers.

6) Site and locate drilling pads on the corners of agricultural fields and route pipelines along farm roads to minimize removal of agricultural land from production.

Biomass Facilities

In general, the pre-application guidance listed above (excluding those in the wind and geothermal energy power plant sections) are applicable to applications for biomass facilities. The following guidance is specific to certain biomass projects and recommended in conjunction with the activities listed above. For municipal solid waste (MSW) conversion to energy power plants and bio fuel refineries (biorefineries), feedstock storage is important to the overall feasibility of the biomass enterprise. Storage may be on the same site as the feedstock source, but in other cases, the necessary volumes can only be achieved by combining the feedstock from a number of relatively close sources at an optimal location.

MSW Conversion to Energy Power Plants

1) Biomass power plants should be located ideally within 25 miles of feedstock sources.

2) Consider use of combined heat and power (CHP, or cogeneration) facilities, if feasible. CHP facilities can achieve thermal efficiencies of 70 to 90 percent because they capture the energy of otherwise wasted heat, compared with 32 to 55 percent for conventional thermal power plants.

3) To conserve water resources, propose use of a closed circuit dry cooling system (e.g., air cooled condenser). If use of dry cooling is infeasible, closed-cycle or recirculating cooling water systems (e.g., natural or forced draft cooling tower) may be considered by regulatory agencies.

4) Design the facility to discourage use by birds and other wildlife

Biorefineries

1) Design the biorefinery with flexibility to handle multiple feedstocks.

2) Locate the biorefinery in close proximity to primary feedstock(s) and near efficient transportation to markets (such as rail). Try to locate a proposed project within a 25 to 50 mile radius of facilities that will provide two to three times the fuel needed for a project to ensure a sufficient and sustainable fuel supply, and to minimize environmental impacts from transportation. Fuels with low moisture content are preferred over fuels with high moisture content.

Chapter 2: General Best Management Practices

BMPs are recommended practices (or combination of practices) that are determined to provide the most effective, environmentally sound, and economically feasible means of managing a project or facility and mitigating the impacts. The BMPs in this document recommend the best set of practices for carrying out renewable energy projects in the desert region and ensuring minimal direct, indirect and cumulative impacts to natural, cultural and human resources. The recommendations and protocols discussed in these BMPs are suggestions for permitting agencies and developers to use at their discretion, and as a resource for other parties involved in the permitting process. The BMPs are recommended in the spirit of informing project developers of the typical practices that agencies expect and require in permits or other regulatory approval documents. The BMPs address the permitting / pre-construction, construction, operation, repowering / retrofitting and decommissioning phases of development.

This chapter identifies BMPs for the desert renewable energy projects addressed in Executive Order S-14-08 and Secretarial Order 3285, in general, and including transmission facilities, for technical areas ranging from air quality to water resources. Following this chapter, are BMPs specific to individual renewable energy technologies, including solar, wind, geothermal, and biomass. The technology specific BMPs are to be considered together with the general BMPs found in this chapter. The BMPs are numbered to facilitate review and discussion; the numbering sequence does not indicate the priority or importance of any particular activity.

BMPs are too general to be project specific mitigation measures. The specific measures will be developed during individual project regulatory processes. Additionally, the list of BMPs should not be considered to be a final list as additional BMPs may be identified to avoid and / or minimize impacts based on site-specific characteristics of a proposed project.

Air Quality

1) Apply for, secure, and comply with all appropriate air quality permits for project construction and operations from the local Air Quality Management District and from the USEPA, if appropriate, prior to construction mobilization. The appropriate air quality permits should be valid and remain in force for the life of the project.

2) Use low sulfur and low aromatic fuel meeting California standards for motor vehicle diesel fuel.

3) For combustion emission sources, use emission controls.

4) Prepare a report outlining the sources and amounts of greenhouse gases (GHG) from the project construction, equipment transportation, operation, and maintenance activities and identify measures to reduce or mitigate greenhouse gas emissions, depending on attainment status.

5) Prepare and comply with a dust abatement plan in cooperation with the local air quality management district that addresses emissions of fugitive dust during construction and operation of the project. Provisions for monitoring fugitive dust should be part of the abatement plan and follow protocols established by CARB. Consider incorporating the following practices in the plan:

a) Use dust suppressant applications or other suppression techniques to control dust emissions from onsite unpaved roads and unpaved parking areas, as well as to mitigate fugitive dust emissions from wind erosion on areas disturbed by construction activities. When considering use of water or chemical dust suppressants take into account water supply and chemical dust suppressant issues.

b) Limit traffic speeds on all unpaved site areas to 10 miles per hour.

c) Cover all trucks hauling soil, sand, and other loose materials or require all such trucks to maintain at least two feet of freeboard.

d) Post and enforce speed limits on the project site and all project access roads.

e) Inspect and clean, as necessary construction equipment vehicle tires so they are free of dirt prior to entering paved roadways.

f) Provide gravel ramps of at least 20 feet in length at tire cleaning stations.

g) Gravel or treat unpaved exits from construction sites to prevent track-out to public roadways.

h) Direct all construction vehicles to enter the construction site through gravel or treated entrance roadways, unless alternative routes are approved by the air quality management district.

i) Provide sandbags or other measures in areas adjacent to paved roadways, as specified in the SWPPP, to prevent run-off to roadways.

j) Sweep paved roads to prevent accumulation of dirt and debris.

6) Ensure wind erosion control techniques (e.g., windbreaks, water, and vegetation) are used on all access and maintenance routes and materials stockpiles that may be disturbed during project maintenance and operation. Use of chemical dust suppressants should be avoided in and around areas occupied by special status species. Any windbreaks used should remain in place until the soil is stabilized or permanently covered with vegetation.

7) Ensure construction and maintenance vehicles and equipment comply with California Air Resources Board and USEPA emissions standards.

8) Use off-road construction diesel equipment that has a rating of 100 hp to 750 hp and that meets the Tier 3 California Emission Standards for Off-Road Compression-Ignition Engines as specified in Title 13, California Code of Regulations section2423(b)(1). All construction diesel engines, which have a rating of 50 hp or more, should meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in Title 13, California Code of Regulations section 2423(b)(1). All heavy earth moving equipment and heavy duty construction related trucks with engines meeting the requirements above should be properly maintained and the engines tuned to the engine manufacturer's specifications. No diesel heavy construction equipment should idle for more than five minutes, to the extent practical.

9) Consider the use of vehicle and equipment exhaust filters and catalysts to reduce air emissions during construction and operation.

10) Consider using ultra low sulfur diesel with a 15 part per million sulfur contact, biodiesel or alternative fuels to reduce project criteria and GHG pollutants.

Biological Resources

During the environmental review and regulatory decision-making processes lead agencies will be consulting with FWS and DFG pursuant to the federal and state Endangered Species Acts, NEPA and CEQA. The consultations and any determinations of effects on protected species will be based on the BAs prepared for filling of applications to the lead agencies. The consultation activities may highlight impacts to protected species and mitigation that may or may not be addressed in the BAs or the following BMPs. Guidance for preparing consultation initiation packages and common flaws in developing effect determinations is provided in Appendix D: Biological Resource Survey and Assessment Guidance.

General to any species of interest

1) Minimize, to the extent practicable, the area disturbed by pre-construction site monitoring and testing activities and installations.

2) Use construction and installation techniques that minimize new site disturbance, soil erosion, and removal of vegetation.

3) Use maps that show the location of sensitive resources and the results of pre-permitting studies to establish the layout of facilities, roads, fences, and other infrastructure.

4) Avoid or minimize site / project area disturbance to special status species and unique plant assemblages.

5) Utilize existing roads and utility corridors to the maximum extent feasible to minimize the number and length / size of new roads, lay-down areas, and borrow areas.

6) Install and maintain transmission line towers / poles, access roads, pulling sites and storage and parking areas to avoid special status species or unique plant assemblages adjacent to linear facilities, in consultation with permitting agencies.

7) Install and maintain facility lighting to prevent up and side casting of light towards wildlife habitat.

8) Bury electrical collector lines in a manner that minimizes additional surface disturbance (e.g., along roads or other paths of surface disturbance). Overhead lines can be considered in cases where burying lines would result in disturbance of significant habitat, but must be balanced with the concern for creation of additional bird perching opportunities.

9) Delineate the boundaries of all areas to be disturbed using temporary construction fencing and / or flagging prior to beginning construction activities, and confine all disturbances, project vehicles and equipment to the delineated project areas.

10) Ensure that vehicular traffic is confined to existing routes of travel to and from the project site, and prohibit cross country vehicle and equipment use outside of approved designated work areas.

11) Use road surfacing, road sealant, soil bonding, and stabilizing agents, if needed on non-paved surfaces that have been shown to be non-toxic to wildlife and plants.

12) If the application of water is needed to abate dust in construction areas and on dirt roads, use the least amount needed to meet safety and air quality standards and prevent the formation of puddles, which could attract wildlife to construction sites.

13) Minimize construction and operation related noise levels to minimize impacts to wildlife.

14) Use explosives only within agency approved specified times and at specified distances from sensitive wildlife and habitats.

15) Maintain all vehicles and equipment in proper working condition to minimize fugitive emissions and accidental spills from motor oil, antifreeze, hydraulic fluid, grease, or other fluids or hazardous materials. All fuel or hazardous waste leaks, spills, or releases should be stopped or repaired immediately and cleaned up at the time of occurrence. Project developers should be responsible for spill material removal and disposal to an approved offsite landfill and spill reporting to the permitting agencies. Service construction equipment should be stored at designated areas only. Service / maintenance vehicles should carry appropriate equipment and materials to isolate and remediate leaks or spills. A spill containment kit should be available onsite for all fueling, maintenance, and construction activities.

16) Dispose of all trash and food-related items in self-closing, sealable containers with lids that latch to prevent wind and wildlife from opening containers. Trash containers should be emptied daily and removed from the project site when construction activities are complete.

17) Prohibit workers or visitors from 1) feeding wildlife, 2) bringing domestic pets to the project site, 3) collecting native plants, or 4) harassing wildlife.

18) Designate a qualified biologist (approved by FWS and DFG) who would be responsible for overseeing compliance with all biological resources BMPs during mobilization, ground disturbance, grading, construction, operation, and closure / decommissioning or project abandonment activities, particularly in areas containing or known to have contained sensitive biological resources, such as special status species and unique plant assemblages. The qualified biologist should be responsible for actions including, but not limited to, the following:

    a) Clearly marking sensitive biological resource areas and inspecting these areas at appropriate intervals for compliance with regulatory terms and conditions.

    b) Inspecting active construction areas where animals may have become trapped (e.g., trenches, bores and other excavation sites outside the permanently fenced area that constitute wildlife pitfalls) prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm's way.

    c) Overseeing cactus and yucca salvage operations.

    d) Recording and reporting any hazardous spills immediately as directed in the project Hazardous Materials Management Plan.

    e) Coordinating directly and regularly with representatives of the permitting agencies regarding any biological resources issues, including implementation of biological resource BMPs.

    f) Maintaining written records regarding implementation of biological resource BMPs and providing a summary of these records periodically in a report to the appropriate agencies.

g) Notifying the project owner and appropriate agencies of any non-compliance with any biological resources BMPs.

19) Develop a project-specific Worker Environmental Awareness Program (WEAP) that meets the approval of the permitting agencies and would be implemented during all phases of the project (e.g., site mobilization, ground disturbance, grading, construction, operation, closure / decommissioning or project abandonment and restoration / reclamation activities). The purpose of the WEAP would be to identify sensitive biological resources and BMPs for minimizing impacts to resources. Interpretation should be provided for non-English speaking workers, and the same instruction should be provided for any new workers prior to their performing work onsite. The names of all onsite personnel (e.g., surveyors, construction engineers, employees, contractors, contractor's employees, subcontractors, etc.) who have participated in the education program should be kept on file at the project field construction office. The program should include but not be limited to the following:

a) photos and habitat descriptions for all special status species that may occur on the project site and information on their distribution, general behavior and ecology;

b) the sensitivity of these species to human activities;

c) legal protections afforded these species;

d) project BMPs for protecting species;

e) penalties for violation of State and Federal laws;

f) worker responsibilities for trash disposal and safe / humane treatment of any special status species found on the project site, associated reporting requirements, and any specific measures required of workers to prevent take of threatened or endangered species;

g) handout materials summarizing all the contractual obligations and protective requirements specified in project permits and approvals; and

h) requirements and penalties regarding adherence to speed limits on the project site.

20) Develop and implement a project specific integrated weed management plan that meets the approval of the permitting agencies that would be implemented during all phases of the project (e.g., site mobilization, ground disturbance, grading, construction, operation, modification or expansion, closure / decommissioning or project abandonment, and restoration / reclamation activities). The plan should include, but not be limited to, the following to prevent the establishment, spread and propagation of noxious weeds:

a) Limit the size of any vegetation and / or ground disturbance to the absolute minimum, and limit motorized ingress and egress to defined routes.

b) Store project vehicles onsite in designated areas to minimize the need for multiple washings of vehicles that re-enter the project site.

c) Maintain vehicle wash and inspection stations and closely monitor the types of materials brought onto the site.

d) Thoroughly clean the tires and undercarriage of all vehicles entering or reentering the project site.

e) Reestablish native vegetation quickly on disturbed sites.

f) Monitor and quickly implement control measures to ensure early detection and eradication for weed invasions.

g) Use certified weed-free straw or hay bales for sediment barrier installations.

h) Train employees and contractors to carry out the WEAP and on their role in ensuring the effectiveness of their efforts in implementing the Plan.

i) Prepare a project specific restoration, revegetation and reclamation plan that meets the approval of the permitting agencies that would be implemented during all phases of the project. The plan should address, at a minimum:

j) Minimizing natural vegetation removal and considering cutting or mowing vegetation rather than total removal whenever possible.

k) Salvage and relocation of cactus and yucca from the site prior to the initiation of construction activities.

l) Identification of protocols to be used for vegetation salvage.

m) Reclamation of all areas of temporarily disturbed soil using certified weed free native vegetation and topsoil salvaged from all excavations and construction activities.

n) Restoration and reclamation of all temporarily disturbed areas, including pipelines, transmission lines, staging areas, and temporary construction-related roads as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to facilitate the recovery to natural habitats.

o) Specifying proper seasons and timing of restoration and reclamation activities to ensure success.

21) Prepare a vector (such as mosquitoes or rodents) control plan for the facility, as appropriate, that meets the approval of the permitting agencies and would be implemented during all phases of the project.

22) Prepare a project-specific mitigation and monitoring plan in cooperation with and that meets the approval of the permitting agencies. The plan should be carried out during all phases of the project and in general, should identify appropriate levels of mitigation to compensate for significant direct, indirect, and cumulative impacts to, and loss of habitat for, special status plant and animal species and should include, but not be limited to, the following:

a) All biological resource mitigation, monitoring and compliance measures required by DFG, BLM, FWS, Energy Commission, and/or other agencies.

b) All sensitive biological resources to be avoided, impacted, and mitigated by project construction, operation, and decommissioning.

c) A detailed description of measures that should be taken to minimize or mitigate permanent and temporary disturbances from construction activities.

d) Documentation of sensitive biological resources expected to be affected by all phases of the project.

e) All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction.

f) Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities.

g) Duration for each type of monitoring and a description of monitoring methodologies and frequency.

h) Performance standards and criteria to be used to determine if / when proposed mitigation is or is not successful.

i) All standards and remedial measures to be implemented if performance standards and criteria are not met.

j) A discussion of biological resources-related facility decommissioning measures including a description of funding mechanism(s).

23) To the greatest extent practicable, existing roads, substations, ancillary facilities and disturbed areas should be re-used in repower layouts.

24) For a repowering or retrofit project, roads and facilities that are no longer needed should be removed or stabilized and re-seeded with native plants appropriate for the soil conditions and adjacent habitat. Plants should be derived from local seed sources where feasible. The term "local" in this context means seed sources with a genetic makeup that do not vary substantially from seeds or plants found at the disturbed location.

25) Prepare a project specific closure / decommissioning or abandonment plan that meets the approval of the permitting agencies. The plan should also be implemented in the event of project abandonment. The plan should include, but not be limited to, the following:

a) Removal of transmission conductors, power lines, fencing when they are no longer used and useful.

b) Removal of all above ground power plant site facilities and related facilities when they are no longer used or useful.

c) If the site has been terraced or otherwise substantially altered from its natural contour, recontouring may be necessary.

d) If the plan anticipates removal of topsoils, it should address storing and vegetation of the soils. Soil profiles should be restored so that topsoils will establish and maintain pre-construction native plant communities to the extent possible.

e) Methods for restoring wildlife habitat and promoting the re-establishment of native plant and wildlife species.

f) Methods for restoring vegetation cover, composition, and diversity to values commensurate with the natural ecological setting. The plan should call for use of local seed sources and identify those sources, where possible.

g) Re-vegetation of the project site and other disturbed areas utilizing appropriate native seed mix.

h) Criteria that would trigger implementation of the plan (e.g., nonoperational for one year or more).

i) A cost estimate to complete closure/decommissioning-related activities.

j) A funding mechanism to ensure sufficient funds are available for revegetation, reclamation, and decommissioning.

26) Apply all management plans, BMPs, and stipulations prepared for the construction phase to similar activities during any project modifications or expansions and the closure/decommissioning phase or upon project abandonment.

Plants

1) Follow BLM and DFG guidance/requirements regarding mapping/surveying for succulents, including yucca and various cactus species. Include, at a minimum, counting all barrel cacti, Joshua trees, Mohave yuccas, or old growth Sonoran Desert woodland trees, and photo-documenting any BLM/DFG sensitive plants species found within the area that may be directly and indirectly impacted by the project.

2) Avoid, to the extent possible, areas of high succulent/yucca/cactus density.

3) Salvage and transplant succulents/yucca/cactus in the project area. Develop a salvage and transplantation plan for succulents/yucca/ cactus for approval by BLM/DFG.

Avian Species [not applicable to common raven (*Corvus corax*)]

1) Conduct pre-construction nest surveys in accordance with BLM, FWS, and DFG guidelines, if construction activities are anticipated to occur from February 1 through August 31. Surveys should be conducted within all potential nesting habitat in the proposed project site and within 500 feet of the boundaries of the site and linear facilities. Presence of larger bird species may require larger survey areas; check with the appropriate agencies for further information.

2) For active nests detected during the survey, retain an avian-qualified biologist to identify a buffer zone (protected area surrounding the nest) and develop a monitoring plan in coordination with BLM, DFG, FWS and/or other appropriate agencies.

3) Retain an avian qualified biologist to monitor the nest until he/she determines that nestlings have fledged and dispersed. Activities that might, in the opinion of an avian-qualified biologist, disturb nesting activities should be prohibited within the buffer zone until such a determination is made.

4) Establish non-disturbance buffer zones to protect raptor nests, bat roosts, areas of high bird or bat use, or specials-status species habitat identified in pre-construction studies. Determine the extent of the buffer zone in consultation with the appropriate agencies.

5) Develop an Avian Protection Plan to protect migratory birds, while improving avian conservation and safety and reliability for utility customers. Consult guidance in the California Guidelines (Appendix E) and *Avian Protection Plan Guidelines* published by the Avian Power Line Interaction Committee (APLIC) and FWS (Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service 2005) http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/APP/AVIAN%20PROTECTION%20PLAN%20FINAL%204%2019%2005.pdfs.

6) Install and maintain transmission lines and all electrical components in accordance with the APLIC *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006) to reduce the likelihood of electrocutions of raptors and other large birds.

7) Install and maintain transmission lines and all electrical components in accordance with the APLIC *Mitigating Bird Collisions with power lines: The State of the Art in 1994* (Avian Power Line Interaction Committee 2004) to reduce the likelihood of bird collisions.

8) Place low and medium voltage connecting power lines underground to the extent possible, unless burial of the lines is prohibitively expensive (i.e., where shallow bedrock exists) or where greater impacts to biological resources would result such as in wetlands.

   a) Overhead lines may be acceptable if sited away from high bird crossing locations, such as between roosting and feeding areas or between lakes, rivers and nesting areas.

   b) Overhead lines may be acceptable when they parallel tree lines, or are otherwise screened so that collision risk is reduced.

9) Communication towers and permanent meteorological towers should not be guyed. If guy wires are necessary, bird flight diverters or high visibility marking devices should be used.

10) Install and maintain facility lighting to prevent upward and side casting of light towards wildlife habitat and propose use of motion sensors. If the Federal Aviation Administration (FAA) requires lighting to alert aircraft of turbines or towers, minimize risk of avian collisions by using red or white strobe lights on the structures. The strobes should be on for as brief a period as possible and the time between strobe or flashes should be the longest possible. Strobes should be synchronized so that a strobe effect is achieved and towers are not constantly illuminated.

11) Use lights with sensors and switches to keep lights off when not required.

12) Minimize use of high intensity lighting, steady-burning, or bright lights such as sodium vapor or spotlights.

13) If the use of open evaporation ponds is permitted for the project and especially if the water would be considered toxic to wildlife, design the ponds to discourage their use by birds and other wildlife.

Species Specific: Burrowing Owl

1) Retain a qualified biologist to complete a preconstruction survey for burrowing owls in any areas subject to disturbance from construction no less than 30 days prior to the start of initial ground disturbance activities. Preconstuction surveys should consist of four separate site visits conducted on different dates to maximize detection. If burrowing owls are present within 500 feet of the project site or linear facilities, then the DFG burrowing owl guidelines (California Burrowing Owl Consortium 1993) should be implemented.

2) If burrowing owl relocation is determined to be an appropriate conservation measure, develop and implement a Burrowing Owl Mitigation and Monitoring Plan for

approval by DFG and other permitting agencies. The plan should outline the number of new burrows to be created, their locations, and how any created burrows/individuals and compensation land would be protected for the life of the project.

Species Specific: Bald and Golden Eagles

Comply with the new authorization *Eagle Permits; Take Necessary to Protect Interests in Particular Localities* (Federal Register / Vol. 74, No. 175, September 11, 2009), where proposed projects may result in take of bald or golden eagles. Where applicable, incorporate actions to avoid disturbance of eagles in accordance with the FWS *National Bald Eagle Management Guidelines, May 2007*.

Species Specific: Desert Tortoise

1) Conduct project activities when desert tortoises are inactive (typically November 1 to March 14), to minimize impacts to roaming individuals.

2) Retain a desert tortoise Authorized Biologist[2] approved by DFG and FWS who would be responsible for ensuring compliance with desert tortoise BMPs prior to the initiation of and during ground-disturbing activities. The Authorized Biologist should conduct clearance surveys, tortoise handling, artificial burrow construction, egg handling and other procedures in accordance with the *Guidelines for Handling Desert Tortoise during Construction Projects* (Desert Tortoise Council 1994) or the most current guidance provided by FWS.

3) The Authorized Biologist should be present on-site from March 15 through October 31 (active season) during ground-disturbing activities in areas that have not been enclosed with tortoise exclusion fencing. The Authorized Biologist should be on-call from November 1 to March 14 (inactive season) and should check construction areas that have not been enclosed with tortoise exclusion fencing immediately before construction activities begin at all times.

4) Incorporate desert tortoise exclusion fencing, approved by FWS and DFG, into any permanent fencing surrounding the proposed facility prior to the initiation of ground-disturbing activities to avoid potential harm to desert tortoise in the project area. Tortoise exclusion fencing should be constructed in accordance with the *Desert Tortoise Exclusion Fence Specifications* (U.S. Fish and Wildlife Service 2005) or the most current guidance provided by FWS and DFG.

5) Install desert tortoise exclusion fencing around temporary project areas such as staging areas, storage yards, excavations, and linear facilities during construction. Construct fences in late winter or early spring to minimize impacts to tortoises and accommodate subsequent tortoise surveys.

6) Within 24 hours prior to the initiation of construction of tortoise exclusion fence, the Authorized Biologist should survey the fence alignment to ensure it is cleared of desert tortoises. Following construction of the tortoise-exclusion fence, the Authorized Biologist should conduct clearance surveys within the fenced area to ensure as many desert tortoises as possible have been removed from the site.

7) Install and regularly maintain gates that remain closed, except for the immediate passage of vehicles, to prevent desert tortoise passage into the project area.

[2] Please contact the FWS for a copy of the *Desert Tortoise Authorized Biologist Request Form*.

8) Heavy equipment should only be allowed to enter the project site following the completion of desert tortoise clearance surveys of the project area by the Authorized Biologist. The Authorized Biologist should monitor initial clearing and grading activities to ensure any tortoises missed during the initial clearance survey are moved from harm's way.

9) Ensure that any damage to the permanent or temporary fencing is immediately blocked to prevent tortoise access and permanently repaired within 72 hours between March 15 and October 31, and within 7 days between November 1 and March 14. Following installation, the permanent fencing should be inspected quarterly and after major rainfall events to ensure fences are intact and there is no ground clearance under the fence that would allow tortoise to pass.

10) The Authorized Biologist should inspect any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, before the material is moved, buried or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after desert tortoise clearance surveys have been completed.

11) Ensure vehicular traffic does not exceed 25 miles per hour within the delineated project areas or on access roads in desert tortoise habitat. On unpaved roads the speed limit should be 10 miles per hour to suppress dust and protect air quality.

12) Any time a vehicle or construction equipment is parked in desert tortoise habitat outside the permanently fenced area, the Authorized Biologist or drivers of the vehicle should inspect the ground under the vehicle for the presence of desert tortoise before it is moved. If a desert tortoise is observed, it should be left to move on its own. If it does not move within 15 minutes, the Authorized Biologist may remove and relocate the animal to a safe location.

13) Design culverts to allow safe passage of tortoises.

14) If desert tortoise relocation is determined to be an appropriate conservation measure, develop and implement a Desert Tortoise Translocation Plan for approval by DFG, FWS, BLM and other permitting agencies. The Plan should designate a relocation site as close as possible to the disturbance site that provides suitable conditions for long-term survival of the relocated desert tortoise and outline a method for monitoring the relocated tortoise.

15) If desert tortoises are observed within the proposed action area, consult with CDFG and FWS to determine the need for and / or feasibility of conducting relocation or translocation as minimization or mitigation for project impacts. Development and implementation of a translocation plan may require, but not be limited to, additional surveys of potential recipient sites; disease testing and health assessments of translocated and resident tortoises; and consideration of climatic conditions at the time of translocation. Because of the potential magnitude of the impacts to desert tortoise from proposed renewable energy projects, DFG and FWS must evaluate translocation efforts on a project by project basis in the context of cumulative effects.

Species Specific: Mohave ground squirrel

1) Retain a Mohave ground squirrel qualified biologist, approved by DFG and other permitting agencies, to complete a pre-construction survey for Mohave ground

squirrels for any areas subject to disturbance from construction no less than 30 days prior to the start of initial ground disturbance activities. The authorized biologist would be responsible for ensuring compliance with related BMPs and mitigation measures. The biologist should conduct clearance surveys, Mohave ground squirrel handling, artificial burrow construction, and other procedures in accordance with DFG protocols.

2) If Mohave ground squirrels are found in burrows during project-related activities on the project site, the qualified biologist should relocate the animal to a burrow at a protected offsite location approved by DFG.

Species Specific: Gila monster

Retain a qualified biologist, approved by the DFG and other permitting agencies, to capture and maintain any Gila monster found onsite in a cool (less than 85 degrees F) environment until it can be released to a safe, suitable area beyond the construction impact zone. The qualified biologist should coordinate with DFG in the transport and relocation of any Gila monsters encountered during project surveys, construction, or operation.

Species Specific: American Badger

Retain a qualified biologist, approved by the DFG and other permitting agencies, to conduct preconstruction surveys for badger dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. If badger dens are found, each den should be classified as inactive, potentially active, or definitely active. Inactive dens should be excavated by hand and backfilled to prevent reuse by badgers. Potentially and definitively active dens should be monitored for three consecutive nights using a tracking medium (such as diatomaceous earth or fire clay) at the entrance. If no tracks are observed in the tracking medium after 3 nights, the den should be excavated and backfilled by hand. If tracks are observed, the den should be progressively blocked with natural materials (rocks, dirt, sticks, and vegetation piled in front of the entrance) for the next 3 to 5 nights to discourage the badger from continued use. The den should then be excavated and backfilled by hand to ensure that no badgers are trapped in the den. Any excavation and filling activities should be performed by the qualified biologist and conducted outside of the breeding season to ensure young badgers are not affected.

Species Specific: Peninsular Bighorn Sheep

Retain a qualified biologist, approved by the DFG, FWS and permitting agencies, to conduct preconstruction surveys for Peninsular bighorn sheep. If Peninsular bighorn sheep or their migration routes exist , are likely to exist on or in the vicinity of the project site and may be affected by project related activities, the developer should consult with DFG, FWS and other stakeholders as appropriate regarding avoidance, minimization, compensatory mitigation or site abandonment.

Cultural and Historic Resources

1) After completing pre-application site surveys described in the Cultural and Historic Resources section in Chapter 2, project developers should expect to prepare CRMMPs or participate in preparing PAs after filing their applications to lead agencies but prior to receiving project permits or licenses. Generally, project developer cultural resource specialists prepare CRMMPS for projects in which few cultural and historical resources are found. For projects where many such resources are present, PAs are

generally prepared by the lead agencies and reviewed by project developments. Often the PAs include terms and conditions for additional site surveys.

2) Retain a qualified cultural resources specialist[3] and if eligible cultural resources are present within the APE, the project developer's cultural resources specialist should develop a Cultural Resources Management and Mitigation Plan (CRMMP). The CRMMP should include the proposed processes by which the significant cultural resources will be preserved for the future. This may involve avoiding the cultural resources and placing the sites or properties into a conservation easement. Other mitigation options include additional investigations including detailed recordation, mapping, and excavation, if warranted. Construction monitoring by a qualified archeologist may also be deemed an appropriate mitigation requirement. A report of all findings, methodologies, results, and interpretations should be prepared for all mitigation efforts. The CRMMP should include but not be limited to:

   a) establishment of a data recovery program;

   b) establishment of a monitoring program;

   c) identification of measures to prevent potential looting / vandalism or ground disturbing impacts;

   d) a cultural resources training program to be presented to all workers;

   e) a public outreach program;

   f) provide for the curation of any archeological or historical materials recovered as a result of the project in a federally recognized repository.

3) If cultural resources are located during any phase of project construction, work in the area should immediately cease and the permitting agencies notified. Work should not resume in the discovery's location until surveyed by the cultural resources specialist and approved by the permitting agencies.

4) If adverse effects to historic properties will result from a project, a historic property treatment plan should be developed in consultation with the SHPO, the appropriate Federally recognized Tribes, and any consulting parties. The plan should outline how the impacts to the historic properties would be mitigated, minimized, or avoided. Fully consider applicable mitigation measures during the project's early stages to resolve adverse effects on historic properties.

Hazardous Materials, Pesticides and Waste Management

1) Ensure that on-site workers are fully trained to properly handle and are informed about each of the hazardous materials that will be used on-site.

2) Prepare a hazardous materials management plan addressing storage, use, transportation, and disposal of each hazardous material anticipated to be used, stored, or transported at the site. The plan should establish inspection procedures, storage requirements, storage quantity limits, inventory control, nonhazardous product substitutes, and disposition of excess materials and be implemented during all phases of the project. The plan should also identify requirements for notices to federal and

[3] A qualified cultural resources specialist has training and background that conforms to the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 CFR Part 61)

local emergency response authorities and include emergency response plans. Project developers should contact the local certified unified program agency (CUPA) for requirements and enrollment in the CUPA's hazardous waste generator program. If the plan calls for treating hazardous waste onsite, consult with the CUPA on and obtain the required authorizations for the treatment activity from the state or local permitting agency.

3) If Environmental Site Assessments (as recommended in Chapter 1, Hazardous Materials, Pesticides, and Waste Management Section) determine that remediation is necessary, ensure the remediation activities are conducted in accordance with the appropriate regulatory agency requirements and oversight. Demonstrate that the site has been cleaned up in accordance with all applicable laws, ordinances, regulations and standards.

4) Prepare a construction and operation waste management plan identifying the waste streams that are expected to be generated at the site and addressing hazardous waste determination procedures, waste storage locations, waste-specific management, recycling and disposal requirements, inspection procedures, inventory selection and control, and waste minimization procedures. The plan should be implemented during all phases of the project and address all solid and liquid wastes that may be generated at the site in compliance with the Clean Water Act requirements to obtain the project's NPDES permit. Consider, for example, the following in the plan:

    a) identifying and controlling practices that produce wastes and wastewater, such as: metal fabrication, zero liquid discharge residue, grinding and finishing; storing and disposing of solid and liquid waste; vehicle and equipment refueling, maintenance service, washing, engine cleaning, and parking.

5) Prepare and implement a spill prevention and response plan identifying where hazardous materials and wastes are stored on site, spill prevention measures to be implemented, training requirements, appropriate spill response actions for each material or waste, the locations of spill response kits on site, a procedure for ensuring that the spill response kits are adequately stocked at all times, and procedures for making timely notifications to authorities. Consider including the following practices, at a minimum, in the plan:

    a) Place equipment and vehicle maintenance and repair areas under a roof.

    b) Work on engines, transmissions, miscellaneous repairs, and changing automotive fluids (brake fluid, transmission fluid, gear oil, radiator fluids, and air conditioner Freon or refrigerant) should be conducted in a covered area using drip pans when there is a likelihood of leaks or spills. Use absorbent materials for spill prevention and cleanup.

    c) Promptly cleaning up vehicle leaks, using a rag or absorbent material; properly disposing of used rags or spent sorbents.

    d) Fueling vehicles should be done where spills or leaks will be contained and cleaned up quickly.

6) Ensure secondary containment is provided for all on-site hazardous and extremely hazardous materials and waste storage, including fuel. In particular, fuel storage (for construction vehicles and equipment) should be a temporary activity occurring only for as long as is needed to support construction activities.

7) Ensure wastes are properly containerized, covered and removed periodically for disposal at appropriate off-site permitted disposal facilities.

8) In the event of an accidental hazardous waste release to the environment, document the event, including a root cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event should be provided to the permitting agencies and other federal and state agencies within 30 days, as required.

9) If pesticides are used on the site, prepare an integrated pest management plan to ensure that pesticide applications would be conducted within the framework of State and federal policies and entail only the use of USEPA registered and state approved pesticides that permitting agencies have authorized. Pesticide use should be limited to non-persistent, immobile pesticides. Pesticides should only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. All pesticides should be used, stored, and disposed of in accordance with their label.

10) If potentially contaminated soil (as evidenced by discoloration, odor, detection by handheld instruments, or other signs) is identified during site excavation grading, or construction at either the proposed site or linear facilities, a qualified Professional Civil Engineer, Professional Geologist or Registered Environmental Assessor should inspect the site. The inspection should determine the need for sampling to confirm the nature and extent of contamination, before continuing activities in the area of the suspected contamination. Project construction activities should not be allowed to continue in the area until the suspected contamination is assessed and remediated as necessary to comply with applicable environmental and worker health and safety laws, ordinances, regulations, and standards.

11) Rinsing of herbicide / pesticide spray tanks should not occur in or near water bodies.

12) Minimize herbicide / pesticide treatment in areas that have a high risk for groundwater contamination.

13) Determine the risk of herbicide / pesticide contamination when such substances are used to control vegetation. Consider the weather, soil type, slope, and vegetation type.

14) Use appropriate herbicide-free / pesticide-free buffer zones for herbicides not labeled for aquatic use, based on BLM / U.S. Forest Service risk assessment guidance. The guidance suggests minimum widths of 100 feet for aerial applications, 25 feet for applications dispersed by vehicle and 10 feet for hand-spray applications.

15) Project developers should provide a Debris Management Plan and a Performance Guarantee per the applicable county's Construction and Demolition Recycling Program and should ensure compliance with all of the county's diversion program requirements.

16) Hazardous product leaks and chemical releases that constitute a Recognized Environmental Condition should be remediated prior to completion of decommissioning.

Noise and Vibration

1) Ensure noisy construction activities (including truck and rail deliveries, pile driving and blasting) are limited to the least noise-sensitive times of day (i.e., weekdays only between 7 a.m. and 7 p.m.) for projects near residential or recreational areas.

2) Consider use of noise barriers such as berms and vegetation to limit ambient noise at plant property lines, especially where sensitive noise receptors may be present.

3) Ensure all project equipment has sound-control devices no less effective than those provided on the original equipment. All construction equipment used should be adequately muffled and maintained. Consider use of battery powered forklifts and other facility vehicles.

4) Ensure all stationary construction equipment (i.e., compressors and generators) is located as far as practicable from nearby residences.

5) If blasting or other noisy activities are required during the construction period, notify nearby residents and the permitting agencies 24 hours in advance.

6) Properly maintain mufflers, brakes and all loose items on construction and operation related vehicles to minimize noise and ensure safe operations. Keep truck operations to the quietest operating speeds. Advise about downshifting and vehicle operations in residential communities to keep truck noise to a minimum.

7) Use noise controls on standard construction equipment; shield impact tools. Consider use of flashing lights instead of audible back-up alarms on mobile equipment.

8) Install mufflers on air coolers and exhaust stacks of all diesel and gas-driven engines. Equip all emergency pressure relief valves and steam blow-down lines with silencers to limit noise levels.

9) Contain facilities within buildings or other types of effective noise enclosures.

10) Employ engineering controls, including sound-insulated equipment and control rooms, to reduce the average noise level in normal work areas.

Paleontological Resources

Develop a protocol for unexpected paleontological discoveries. Unexpected discovery of paleontological resources during construction should be brought to the immediate attention of the appropriate permitting agencies. Work should be halted near the discovery to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation measures are being developed.

Safety, Health and Nuisances

1) Prepare a health and safety program to protect both workers and the public during construction, operation, repowering, retrofitting, and closure / decommissioning or abandonment. The plan should describe potential safety issues, worker training programs and other practices to address site access, construction, safe work practices, security, heavy equipment transportation, traffic management, emergency procedures, and fire control. For example, consider the following specific practices:

   a) providing adequate ventilation in work areas to reduce heat and humidity;

   b) reducing time required for work in elevated temperature environments, and ensuring easy access to drinking water in such environments;

   c) providing shields for workers from hot equipment, including generating equipment, pipes and other equipment;

d) installing warning signs near high temperature surfaces and requiring personal protective equipment as appropriate, including insulated gloves and shoes;

e) ensuring control rooms are insulated for sound to achieve noise levels below 60 dBA;

f) installing warning signs in high noise areas and requiring that personal noise protecting gear be used when working in identified high noise areas (typically areas with noise levels greater than 85 dBA);

g) providing an automatic electronic defibrillator.

2) Install and maintain permanent fencing that has been approved by the permitting agency around electrical substations and all mechanical and electrical generation equipment. All equipment access doors should be locked to limit public access.

3) Establish measures to be taken during the construction and operation phase to limit public access to hazardous facilities.

4) Prohibit workers or visitors, with the exception of law enforcement personnel, from bringing firearms or weapons to the project site.

5) Prepare a fire management and protection plan to respond to fires and implement measures to minimize the potential for a human caused or natural caused fire. Train site workers to respond, as appropriate, to fires. A 30 foot firebreak should be maintained within the fenced area containing project facilities.

6) Employ engineering controls, including sound-insulated equipment and control rooms, to reduce the average noise level in normal work areas.

7) Provide personnel with hearing protection when noise levels are expected to above 85 dBA.

8) In the event the project results in EMI, mitigate the problem to the extent appropriate for the owner of the impacted communications system. Additional warning information should be conveyed to aircraft with onboard radar systems, FAA and DOD so that radar echoes from solar and electrical transmission facilities can be quickly recognized.

9) In the event projects cause EMI, address the problem for the owner of the impacted communications system, to the extent appropriate.

10) Remove from the project site and properly dispose of all construction refuse, including, but not limited to, broken equipment parts, wrapping material, cords, cables, wire, rope, strapping, twine, buckets, metal or plastic containers, and boxes.

Soils, Drainage, Erosion, Stormwater, Flooding

1) Prepare and implement a Drainage, Erosion, and Sedimentation Control Plan that ensures proper protection of water quality and soil resources, demonstrates no increase in off-site flooding potential, and includes provisions for stormwater and sediment retention for the project site. The plan should also identify site surface water runoff patterns and develop mitigation measures that prevent excessive and unnatural soil deposition and erosion throughout, including areas downslope of the project site and related construction sites. The plan should be designed to minimize disturbance of the site during construction , operation, repowering/retrofit and decommissioning, and achieve the following:

a) Stabilize disturbed areas that will not be covered with structures or pavement following grading and / or cut and fill operations by means such as moisturizing and compacting.

b) Save removed topsoil for reuse, when possible, by segregating and stockpiling the material. Cover material to prevent erosion.

c) Runoff from parking lots, roof, or other impervious surfaces should be directed to the immediate landscape or directed to retention basins prior to entering the storm drain.

d) Minimize stormwater runoff contamination from vehicle refueling and repair areas by containing such activities to work areas where runoff is collected or controlled.

e) Landscaping that requires little or no irrigation should be used and be recessed to create retention basins / areas to capture runoff.

f) The amount of area covered by impervious surfaces should be reduced through use of permeable pavement or other pervious surfaces.

g) Natural drainages and pre-project hydrographs for the area should be maintained.

2) Prepare a SWPPP for the site prior to construction mobilization to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion.

3) Avoid using invasive species for seeding or planting for erosion control and soil stabilization purposes.

4) Conduct post-construction monitoring of areas that were disturbed during the construction phase, and apply appropriate mitigation as necessary in a timely manner.

5) Conduct regular inspections of permanent erosion control measures to ensure proper working order.

6) After decommissioning, erosion control measures should be installed in all disturbance areas where potential for erosion exists.

Traffic and Transportation

Roads

1) Road construction and maintenance on BLM lands should follow established policy and guidelines within BLM *Manual 9113 – Roads*, state, local and / or other appropriate transportation agencies.

2) Roads that are no longer needed should be abandoned, recontoured and restored using weed-free native grasses, forbs, and shrubs based on BLM, FWS, and / or DFG recommendations.

3) Prepare a transportation plan for implementation during all phases of the project. Address methods for reducing construction worker traffic volumes and transport of project related equipment and materials.

a) Consider providing a construction worker rideshare program.

b) Consider scheduling shift changes and deliveries to avoid conflict with peak hour traffic patterns.

c) Describe transport of facility hazardous and non-hazardous materials, components, main assembly cranes, and other large pieces of equipment.

d) Consider specific object sizes, weights, origin, destination, peak hour traffic, and unique handling requirements and evaluate alternative transportation approaches.

4) Obtain vehicle oversize and overweight permits, as appropriate.

5) Obtain encroachment permits from appropriate agencies.

6) Conduct ongoing ground transportation planning to evaluate road use, minimize traffic volume, and ensure that roads are maintained adequately to minimize associated impacts.

7) Consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type.

8) Ensure signs are placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local commuters, consideration should be given to limiting construction vehicles traveling on public roadways during the morning and late afternoon commute times.

9) Restrict traffic to the roads specified for the project. Use of other unimproved roads should be restricted to emergency situations involving potential injury or loss of life.

10) Instruct project personnel and contractors to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to ensure safe and efficient traffic flow and to reduce wildlife collisions and disturbance and airborne dust. Consider requiring driver attendance at Traffic Safety Awareness training.

11) Vehicle tires should be inspected regularly to allow faulty tires to be replaced before they fail on the road.

12) Implement a program with truck owner/operators to cover loads per California Vehicle Code 23114(a); sweep, clean or hose truck and trailers after loading and unloading and before entering a public road.

13) Repair or reconstruct to pre-project conditions project-related access roads that are damaged by project construction activities.

14) All structures crossing washes or streams should be located and constructed so that they do not decrease channel stability or increase water velocity, to avoid erosion and changes to surface water runoff.

15) Potential soil erosion from road building or use should be controlled at culvert outlets with appropriate structures. Catch basins, roadway ditches, and culverts should be cleaned and maintained regularly.

Aviation

1) Avoid or mitigate impacts to air traffic safety. So that interference from electrical generation facilities can be quickly recognized by aircraft with onboard radar systems, work with the FAA to determine best practices for conveying warning information to the aircraft and mitigating the interference.

2) Notify the FAA of any construction or alteration of navigable airspace within 5,000 feet from a heliport or 20,000 feet of any airport runway more than 3,200 feet in length, via the filing of FAA Form 7460.

3) Avoid or mitigate impacts to DOD / military low fly zones. Work with local and / or appropriate military representatives to determine best practices for conveying warning information to aircraft and mitigating interference to address interference from electrical generation facilities. Notify the appropriate representatives of any proposed construction or alteration of navigable airspace in low fly zones.

Visual Resources

1) Ensure the public is involved and informed about the visual site design elements of the proposed project. Possible approaches include conducting public participation forums for disseminating information, offering organized tours of operating solar developments, and using computer simulation and visualization techniques in public presentations.

2) Reduce visual impacts during construction by minimizing areas of surface disturbance, controlling erosion, using non-chemical dust suppression techniques, and restoring exposed soils as closely as possible to their original contour and vegetation.

3) Color and finish surfaces of all project structures and buildings visible to the public to ensure they minimize visual intrusion and contrast and minimize glare. Paint grouped structures the same color to reduce visual complexity and color contrast.

4) Establish a regular litter pick-up procedure within and around the perimeter of the project site.

5) Use perimeter berms and / or decorative landscape plantings, where appropriate for effective facility screening, on the perimeter of the project site, outside of security fencing. Use native, drought tolerant plants to the maximum extent possible.

6) Inspect landscaping regularly and replace dead plantings in a timely manner.

Water Supply and Quality

1) Ensure that any wastewater generated in association with temporary, portable sanitary facilities is periodically removed by a licensed hauler and disposed into an existing municipal sewage treatment facility.

2) Temporary, portable sanitary facilities provided for construction crews should be adequate to support expected on-site personnel and should be removed at completion of construction activities.

3) Consider cleaning company vehicles at commercial car washes rather than washing vehicles on the company's property so that dirt, grease, and detergents are treated effectively at existing facilities designed to handle those types of wastes.

4) Comply with local requirements for permanent, domestic water use and wastewater treatment.

Chapter 3: Renewable Energy Technology Specific BMPs

The BMPs listed in Chapter 2 and the following BMPs can assist solar, wind, geothermal and biomass energy project developers and regulatory agencies in reducing potential impacts.

Solar Energy Power Plants

BMPs in Chapter 2 address most prospective agency issues and concerns with solar power plants. The following measures address air, biological, soils, visual and water resource issues specific to solar facilities:

1) Prepare a soils plan to deal with the redistribution, removal, and/or off-site storage of soil removed in the course of laser leveling solar project sites.

2) Conduct monitoring to determine if there is a potential for bird incineration and blinding. Discuss methodology for this monitoring with BLM, FWS, the Energy Commission, and DFG and/or other appropriate agencies.

3) Use flashing or strobe lights on heliostat towers to minimize risk of avian collisions.

4) Project developers should formulate a prescription to restore the surface grade and return soil after removal of solar panel arrays during solar site decommissioning.

5) Integrate solar collector/reflector arrays and design with the surrounding landscape to the extent possible.

6) Use the minimum volume of water necessary for mirror washing. Collecting and recycling the wash water is encouraged.

Wind Energy Power Plants

BMPs for addressing biological resources issues specific to wind turbines are as follows. These BMPs and the BMPs in Chapter 2 should be considered by wind energy power plant developers.

Biological Resources

1) Keep lighting at both operation and maintenance facilities and substations located within 0.5 mile of the turbines to the minimum required to meet FAA guidelines and safety and security needs.

2) Locate turbines to avoid separating birds and bats from their daily roosting, feeding, or nesting sites if documented that the turbines' presence poses a risk to species.

3) Although it is unclear whether tubular or lattice towers pose less risk, it is recommended that tubular towers or best available technology be used to reduce ability of birds to perch on turbines.

4) Remove wind turbines when they are no longer cost effective to use or retrofit so they cannot present a collision hazard to birds and bats.

Noise and Vibration

Wind turbines produce noise generated primarily from mechanical and aerodynamic sources. Mechanical noise may be generated by machinery in the nacelle (the structure on the wind turbine that encloses the generation equipment). Aerodynamic noise emanates from the movement of air around the turbine blades and tower. The types of aerodynamic noise may include low frequency, impulsive low frequency, tonal, and continuous broadband. Preventing and controlling noise can be generally accomplished by appropriate siting and turbine design.

1) Site wind farms to avoid locations in close proximity to sensitive noise receptors (e.g. residences, hospitals, and schools).
2) Adhere to national or international acoustic design standards for wind turbines (e.g. International Energy Agency, International Electrotechnical Commission, and the American National Standards Institute).
3) Use variable speed turbines or pitched blades to lower rotational speed.

Shadow Flicker and Blade Glint

Shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow. As the rotor blades rotate, shadows pass over the same point causing an effect termed shadow flicker. Shadow flicker may become a problem when residences are located near or have a specific orientation to the wind farm. Most problems occur generally southwest and southeast of the turbines.

Similar to shadow flicker, blade or tower glint occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact a community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences. Blade glint is a temporary phenomenon for new turbines only, and typically disappears when blades have been soiled after a few months of operation.

Prevention and control measures to address these impacts include the following:

1) Use commercially available modeling software to identify a 'zone' of flicker. Site and orient wind turbines appropriately.
2) Paint wind turbine towers with non-reflective coating.

Visual Resources

Depending on the location and local public perception, wind farms, like other power plants, may impact visual resources. Visual impacts associated with wind energy projects typically concern the turbines themselves (e.g. color, height, and number of turbines) and impacts relating to their interaction with the character of the surrounding landscape. Carrying out the general visual resource BMPs and the following BMPs specific to wind energy power plants will minimize visual impacts.

1) Maintain uniform size and design of turbines (e.g. direction of rotation, type of turbine and tower, and height).
2) Paint the turbines with a non-reflective coating and a uniform color, typically matching the sky (light gray or pale blue), while observing air navigational marking regulations.
3) Avoid lettering, company insignia, advertising, or graphics on the turbines.

Geothermal Energy Power Plants

Agency Decisions and Permitting Guides

In December 2008, the BLM approved a Programmatic EIS (PEIS), (Bureau of Land Management 2008a), and published a Record of Decision (Bureau of Land Management 2008b) to facilitate geothermal leasing in 12 Western states, including California. The decision opened specific acreage on BLM-managed land in the Mojave and Colorado Desert region to geothermal development by amending the following RMPs:

- Caliente RMP (Bakersfield Field Office)
- West Mojave RMP (Barstow Field Office)
- Bishop RMP (Bishop Field Office)
- East San Diego County RMP (El Centro Field Office)
- South Coast RMP (Palm Springs Field Office)

The BLM amended each RMP to include geothermal BMPs, which were published in the Record of Decision as Appendix B (Bureau of Land Management 2008b). These BMPs are potential conditions of approval, which BLM field office staff would include in use authorizations for geothermal exploration, drilling, development and reclamation activities.

In addition, the BLM published environmental BMPs on its website (http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/technical_information.html#field%20guide) and in *The Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development* (Bureau of Land Management 2007) (commonly referred to as the Gold Book). Although these references were published as guidance and standards for the oil and gas industry, the mitigation measures for roads, transmission lines, pipelines, buildings, and screening are applicable guidance for developing and implementing BMPs for geothermal resource power plants.

The Energy Commission approved the Salton Sea Unit #6 Power Project (Energy Commission publication No. 800-03-021, 2003) with conditions of certification and published a geothermal resources permitting guide http://www.energy.ca.gov/2007publications/CEC-500-2007-027/CEC-500-2007-027.PDF (Blaydes & Associates 2007). Both documents provide examples of and explain in detail the requirements for developing geothermal wells and power plants in California.

BMPs

Geothermal project developers are advised to consult Chapter 2 and incorporate the general BMPs applicable to their project and project site. The following BMPs are specific to geothermal projects and are recommended for consideration by project developers. The BMPs below build on decisions and guides mentioned above in the Geothermal Energy Power Plants section of this chapter in addition to *Environmental, Health and Safety Guidelines for Geothermal Power Development* (International Finance Corporation 2007), recommended controls on hydrogen sulfide (H_2S) emissions (Nagl N/D), examples of waste discharge requirements (California Regional Water Quality Control Board, Colorado River Basin Region 2007), and injection well guidance (U.S. Environmental Protection Agency 1999).

Air Quality

The following air quality BMPs include recommendations to reduce emissions of criteria or hazardous air pollutants and H_2S. The USEPA does not classify H_2S as either a criteria air pollutant or a hazardous air pollutant. The State of California, however, adopted an Ambient

Air Quality Standard for H_2S[4] to protect public health and decrease odor annoyance. Air pollution control / management districts may have short-term, maximum (for example, hourly) and annual average standards for stationary sources of H_2S, including geothermal power plants. For example, the Imperial County Air Pollution Control District requires Best Available Control Technology be applied to geothermal power plants with the potential to emit more than 55 pounds per day of H_2S (County of Imperial 1999).

1) Develop an emissions inventory, a list of both long-term (annual) and short-term (generally hourly) emission rates for each relevant pollutant from each emission point source (such as well venting, drill rig diesel engines, fugitive dust, plant silencers, sulfur plant exhaust, cooling towers). Organize emissions inventory by project phase: well-field development (estimate number of wells to be drilled, vented each year); plant operations (estimate number of replacement wells to be drilled each year, and forced and planned outage rates.) Quantify the pollutants contained in the geothermal fluids and steam by testing well venting. Collect fluid and gas samples for every well using independent laboratory and air quality specialist for at least one round of sample collection and chemical analysis.
2) Own both the geothermal production and injection wells as well as the geothermal power plant, so that responsibility for H_2S emission control is not lost between the steam producer and electricity generator.
3) As an integral part of an odor control program, implement an ambient monitoring program for H_2S and meteorology. Continue to operate the meteorological station used to collect baseline data. Use an USEPA reference sulfur dioxide monitor with an in-line sulfur dioxide ($SO_{2)}$ scrubber and H_2S to SO_2 oxidizer for real-time collection of less than 1 part per billion H_2S. Store hourly H_2S and wind data for use whenever odor issues arise.
4) Remove H_2S from condensate by directing the condensate to the cooling tower to which chelated iron and sodium sulfite has been added to the cooling-tower water. These chemicals will react with the H_2S to form a water soluble chemical, which can be injected into the geothermal formation.
5) Remove H_2S from both the condensate and noncondensible gas (NCG) stream by processing the NCG in a thermal oxidizer.
6) When present in small volumes in the NCG stream, remove H_2S with liquid scavengers, rather than solid-based scavengers, so that the spent material can be injected into the geothermal formation for disposal rather than discarded in a landfill.
7) When present in large volumes in the NCG stream, remove H_2S with a liquid redox system.
8) Inject hydrogen peroxide and sodium hydroxide into a well's test line to abate H_2S emissions.

Hazards, Pesticides, Waste Management

1) Increase the pH of spent geothermal brine to keep silica in solution prior to reinjection.

[4] The State's ambient standard for H_2S is a 1-hour average of 0.03 parts per million (30 parts per billion), not to be equaled or exceeded.

2) Return spent geothermal brines, steam condensate, and cooling system blow-down to the geothermal resource via reinjection wells.

3) Assure that hazardous substances and wastes removed from surface impoundments are not leaked, spilled, or otherwise improperly released outside the surface impoundments and into the environment.

4) Remediate any contamination near and around surface impoundments, including the tops of berms and areas downwind from the impoundments, filter cake bay storage areas, hydroblast pads and adjacent areas, pipes containing hazardous waste scale and areas adjacent, and other areas where hazardous waste releases or disposals have occurred.

5) Minimize releases of filter cake into the environment by enclosing filter cake bays with doors or replace filter cake bays with containers or trailers capable of holding the waste material.

6) Prevent filter cake from being released or disposed of into the environment during the transfer to, from, or while stored at the filter cake bays or in end-dump trailers.

7) Ensure that all employees and contractors staff operating at any facility receive appropriate hazardous waste management and high pressure high temperature training (HPHT) prior to conducting any work involving hazardous waste, including hazardous waste treatment, storage, and disposal at the facility, or HPHT environments, including wellsite, pipeline, and power plant operations.

8) Conduct annual environmental audits to identify all hazardous waste streams and determine compliance with all applicable statutory and regulatory provisions of California's Hazardous Waste Control Law and the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program.

9) Maintain a minimum freeboard of two feet at all times within the geothermal brine surface impoundment. Ensure the fluids and brine precipitates discharged to and contained in the surface impoundment never overflow.

10) Install a leak detection system beneath the membrane liner of the geothermal brine surface impoundment. Inspect the system quarterly to ensure brine is not collecting due a membrane-liner breach.

11) Monitor groundwater wells to determine whether the geothermal brine surface impoundment is releasing hazardous waste into groundwater.

12) Clean conveyance systems regularly to prevent buildup of silica scale and the potential for release of solid materials from conveyance systems.

13) Perform pipe maintenance and de-scaling only in areas designated for these activities.

14) Construct hydro blasting areas so that the base is impermeable base and no wastewater can spray or run onto adjacent soil. For example, the hydro blasting area should have 12-foot high walls on three sides. Convey wastewater from the hydro blasting process to the brine surface impoundment for reinjection to the geothermal resource.

15) Containerize drilling mud and cuttings, when possible. Placing muds and cuttings in containers, such as Baker tanks, may not always be practical , but is a practice that avoids discharging such wastes to land.

Noise

BLM regulations seek to "minimize noise," but set no measurable standard. BLM relies on noise criteria published in 1975 by the U.S. Geological Survey in "Geothermal Resources Operational Order No. 4." The order is applicable to people occupying nearby homes, hospitals, schools, and libraries and wildlife, according to the 2008 PEIS and states that federal land lessees may:

> "not exceed a noise level of 65 dB(A) for all geothermal-related activity including but not limited to, exploration, development, or production operations as measured at the lease boundary line or 0.8 km (one-half mile) from the source, whichever is greater, using the A-weighted network of a standard Sound Level Meter. However, the permissible noise level of 65 dB(A) may be exceeded under emergency conditions or with [regulatory] approval if written permission is first obtained by the lessee from all residents within 0.8 km (one-half mile)."

Geothermal resource exploration/testing involves well drilling and less invasive approaches such as geophysical remote sensing. Remote sensing can refine well targeting and reduce the number of wells drilled. The exploration/testing approach is generally identified in a reservoir management plan.

1) Use as few drill sites as is feasible so that fewer people are noise-impacted.

2) Locate the sites as far from residences as possible. In addition, use terrain, such as ridges, and plan the drill site so that noise is projected away from residences, to shield noise impacts to the greatest extent possible. Within two miles of existing, occupied residences, consider restricting geothermal well drilling or major facility construction activities to non-sleeping hours (7 a.m. to 10 p.m.).

3) To dampen drilling rig noise, install acoustical windows in structures occupied by affected parties.

4) Install adequate noise abatement equipment during construction and operation, and maintain it in good condition to reduce noise from any drilling or producing geothermal well located within 1,500 feet of a habitation, school or church. Examples of such equipment include temporary noise shields, cyclone silencers, rock wall mufflers, and sound insulation in pipes. Silencers slow the velocity of steam in the steam processing facility.

Soils and Drainage

Do not use geothermal fluids or exploratory well drilling muds for dust control on access roads, well pads, or within the facility area.

Water/Brine Injection and Water Supply

If geothermal power plants are properly designed and sited, water supply and well injection issues can be addressed. Flash geothermal power plants can satisfy up to 95 percent of their water supply needs, including cooling tower make-up water, by recycling steam condensed from produced geothermal brine (CE Obsidian Energy LLC 2009). Water-cooled binary power plants require an external source of cooling water because the brine remains within a closed-loop system until injected, according to Imperial County (County of Imperial, Department of Public Works N/D). The brine may include concentrated amounts of contaminants which would present problems to the cooling system and the environment. Use of dry cooling or nonpotable or degraded surface or groundwater would protect potable water supplies. Dry cooling can reduce the efficiency or electrical energy output of the power

plant by as much as 50 percent in hot weather. Refer to the Geothermal technology section in Appendix B for more detail.

The quality of underground sources of drinking water (USDW) can be protected through careful well and casing design. Imperial County notes that contamination of groundwater aquifers could be caused by upflow through a fault or by leakage of the injected fluid behind the casing due to a poor cement bond or through a casing damaged by corrosion or mechanical causes.

Water/Brine Injection Well BMPs

1) Begin planning for injection early in the field development stage. Prepare a preliminary injection strategy as soon as the first few exploration and production wells have been drilled and tested.

2) Use tracer testing and numerical modeling of the reservoir to develop an optimum injection strategy. (Disappointing production wells should not necessarily be converted to injection wells.)

3) Prevent injection pressure buildup with proper chemical treatment and/or filtering of the injection fluid to prevent scaling and/or plugging of injection wells.

4) Increase the spacing between injection wells or the number of injection wells to redistribute the total amount of injection over a larger area and, thereby, correct for ground heaving.

5) Avoid locating injection wells near known active faults and do not allow injection pressure to exceed original pore pressure to avert induced seismicity.

6) Design wells with casing that run from the surface to the depth below the USDW. A well should have two casing strings; each sealed its entire length. Test casings, cements, and other materials before selecting them for use in construction at the specific well site.

7) At shallow depths, include multiple casing strings in geothermal wells.

8) If injecting under pressure, monitor injection pressures to avoid excessive pressure and minimize likelihood of injection-induced seismic activity from increased subsurface pressure and the stresses on the injection well equipment.

9) Inject at a rate that will not cause a pressure build-up in the formation or result in reduced fluid temperature at production wells. Monitor injection rates along with pressure monitoring to assess and ensure casing integrity.

10) Design and construct cellars around the casing wellhead. Keep these cellars dry or well drained to prevent corrosion of the casing at the soil-air-water interface.

11) Monitor well integrity to prevent unintended release from within the well to the surrounding formations and interzonal migration of fluids between the casing and the formation.

12) Observe surface conditions daily for casing leaks.

13) If an injection well penetrates a USDW, perform mechanical integrity testing periodically to detect actual and potential leaks, casing failures, and cementing problems. Perform these tests prior to initial injection, after well workovers and repairs, and on a routine schedule during normal operations.

Water Supply BMPs

The use of surface or ground water for cooling a geothermal facility must be thoroughly evaluated and impacts mitigated. This assessment will result in lengthy delays of permitting timeframes.

1) For flash-steam cycle plants minimize the use of fresh water by using geothermal fluid as the major source of cooling water. Use high-efficiency fills in cooling towers to enhance air-to-water contact.

2) For binary geothermal plants, use air-cooled condensers, only, during fall, winter and spring (October through May). During the summer season (June through September) plant electrical efficiency can be improved by using one of the following pre-cooling strategies:

    a) Direct deluge cooling of the air-cooled condenser tubes. Add a purified water rinse to wash away new forming scale when the deluge system is shut down for the winter.

    b) Spray-cooling enhancement (that is, pre-cooling with spray nozzles capable of creating micron-sized water droplets).

    c) Honey-comb, porous evaporative-cooling media (for example, Munters media).

    Use degraded or reclaimed water sources for geothermal-source water supplies, as much as possible. Minimize use of fresh water supplies.

Biomass Facilities

A few biomass facilities are expected to be proposed in the desert region. Due to this possibility BMPs for such facilities are included in this manual. The BMPs listed in Chapter 2 and the following BMPs can assist biomass facility developers in reducing potential impacts. Major sources of information for the biomass facility related BMPs include California Integrated Waste Management Board (2004), Oregon Environmental Council (2009), U.S. Environmental Protection Agency (2004), and International Finance Corporation (2007).

Biomass Facilities: General BMPs

Air Quality

1) Prepare and implement a dust abatement plan that addresses operations, fugitive dust and emissions from the feedstock delivery, storage and preparation. Consider the following practices in the plan:

    a) Use loading and unloading equipment that minimizes the height of fuel drop to the stockpile, and also consider use of cyclone dust collectors in enclosed areas.

    b) Use water spray systems to reduce the formation of fugitive dust from solid fuel storage in arid environments.

    c) Use enclosed conveyors with well designed, extraction and filtration equipment on conveyor transfer points.

2) Consider air quality impacts of fugitive dust and direct emissions from feedstock transport equipment.

3) Conduct regular preventive maintenance to maintain equipment engine emission performance.

Efficiency and Reliability

Maximize use of fuels with low moisture content. Use International Standardization Organization standards and procedures for measuring the moisture content of the feedstock.

Safety, Health and Nuisances

Use automated systems such as temperature gauges or carbon monoxide sensors in solid fuel storage areas to detect fires caused by self-ignition and to identify risk points.

BioRefineries: Specific BMPs

Waste and Emissions

1) Inventory and analyze solid and liquid waste for hazardous material contamination.
2) Measure methanol efficiency and reduce fugitive emissions.
3) Eliminate off gassing from solid and liquid waste products.

Water Supply and Quality

1) Maximize efficient water use by recycling water and using production processes that minimize water use.
2) Protect water quality by using ZLD wastewater technologies.
3) Discharge process water to municipal waste treatment facilities, when appropriate.

MSW Conversion to Energy Power Plants: Specific BMPs

Many of the following measures have been excerpted from information provided by the International Finance Corporation – a World Bank Group – on MSW Incineration Facilities (International Finance Corporation 2008).

Air Quality

1) Interlock the waste charging system with the temperature monitoring and control system to prevent waste additions if the operating temperature falls below the required limits.
2) Implement maintenance and other procedures to minimize planned and unplanned shutdowns.
3) Avoid operating conditions in excess of those that are required for efficient destruction of the waste.
4) Use a boiler to convert the flue-gas energy for the production of steam / heat and / or electricity.
5) Use flue gas treatment system for control of acid gases, particulate matter, and other air pollutants.
6) Consider the application of waste-to-energy or anaerobic digestion technologies to help off-set emissions associated with fossil fuel based power generation.
7) Control dioxins and furans by extensive segregation to ensure complete removal of plastic and other chlorinated compounds.
8) For high performance dioxin removal, use an Activated Carbon Packed Column.

Hazardous Materials, Pesticides and Waste Management

1) Manage bottom ash separately from fly ash and other flue gas treatment residues to avoid contamination of the bottom ash for its potential recovery;

2) Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery;

3) Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use);

4) Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. Hazardous ash should be managed and disposed of as hazardous waste. Non-hazardous ash may be disposed of in an MSW landfill or considered for recycling in construction materials.

5) Spray herbicides to discourage further decomposition of MSW.

Land Use

1) Avoid siting of facilities in exposed, windy areas.

2) Provide perimeter planting, landscaping, or fences to shield from wind.

3) Pin waste by use of dozers and landfill compactors immediately after discharge from the vehicles delivering the waste.

4) Provide an emergency tipping area / foul weather cell for lightweight wastes such as paper.

5) Construct banks and berms immediately adjacent to the tipping area, install strategically placed mobile catch fences close to the tipping area or on the nearest downwind crest, and / or fully enclose of the tipping area within a mobile litter net system.

6) Install wind fencing upwind of the tipping area to reduce the wind strength as it crosses the facility.

7) Temporarily close the facility to specific or all waste or vehicle types when weather conditions are particularly adverse.

Water Supply and Quality

To prevent, minimize, and control water effluents, wastewater from flue gas treatment should be treated as necessary, e.g., using filtration coagulation, precipitation, and filtration to remove heavy metals, and neutralization.

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Glossary and Acronyms

Glossary

AEROD. An air dispersion model preferred or recommended for use by USEPA.

ASTM. ASTM International Standards Worldwide, formerly known as American Society for Testing and Materials. ASTM developed standards (acceptable to California regulators) for conducting hazardous waste site assessments.

Best Management Practices. Suggested practices (or combination of practices) that are determined to provide the most effective, environmentally sound, and economically feasible means of managing a project or facility and mitigating the impacts.

CFR. Code of Federal Regulations.

Construction. The period of time during which a renewable energy project, including transmission lines, roads and other related facilities are being constructed.

dBA. A weighted decibels (used frequently in noise analyses).

Decommissioning/abandonment. This project phase is the cessation of power generation operations and removal of all associated equipment, roads, and other infrastructure. The land is then abandoned, restored or used in other ways.

H_2S. The chemical hydrogen sulfide.

Operation. The project phase during which the renewable energy facility is generating electricity transmitted on the inter and intra state transmission grid or producing and distributing bio-fuels for customer use.

Permitting and pre-construction. The project development phase after applications have been accepted by the lead agencies and includes the project environmental assessment and decision-making process. Project design or redesign may also occur. The phase may also include the time after a project has been approved and project developers are completing measures required by agencies prior to construction.

Pre-application. The project development phase prior to acceptance of AFC, ROW and other permit applications as complete by the applicable lead federal, state, and local agencies. Includes initiation of agency and stakeholder consultations, and much of the project design phase.

Repowering. Repowering refers to modernizing an existing power plant by removing old electrical generation equipment and replacing it with new equipment that is generally more efficient than the old equipment. Repowering may require new permits / approvals or amendments to existing permits / approvals.

Retrofitting. Retrofitting is defined as replacing portions of existing electrical generating equipment or other project facilities so that part of the original turbines, electrical infrastructure or foundation continued to be utilized. New permits / approvals or amendments to existing permits / approvals may be required.

SCREEN. Screening tool models often applied before using a refined air quality model (such as AEROD) to determine if refined modeling is needed.

SO_2. The chemical sulfur dioxide.

T HWELLS. Readily adaptable modeling code for evaluating drawdown from single and multiple pumping wells.

USC. United States Code.

Acronyms

ACOE	Army Corps of Engineers
AFC	Application for Certification
APE	Area of potential effect
APLIC	Avian Powerline Interaction Committee
BA	Biological Assessment
Bio refineries	Biomass Refineries
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
CAISO	California Independent System Operator
California Guidelines	*California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development*
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CHP	Combined Heat and Power
CPUC	California Public Utilities Commission
CPV	Concentrated Photovoltaic
CREZ	Competitive Renewable Energy Zone
CRHR	California Register of Historical Resources
CRMMP	Cultural Resources Monitoring and Mitigation Plan
CSP	Concentrating Solar Power
CUP	Conditional Use Permit
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
DFG	California Department of Fish and Game
DOC	Determination of Compliance
DOD	Department of Defense
DOGGR	California Department of Conservation, Division of Oil, Gas and Geothermal Resources

DPR	California Department of Parks and Recreation
DRECP	Desert Renewable Energy Conservation Plan
EIS	Environmental Impact Statement
EMI	Electromagnetic Interference
Energy Commission	California Energy Commission
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FWS	U.S. Fish and Wildlife Service
HPHT	High pressure high temperature
LAFCo	Local Agency Formation Commission
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
MW	Megawatt
NCG	Noncondensable gas
NEPA	National Environmental Protection Act
NPDES	National Pollution Discharge Elimination System
PA	Programmatic Agreement
PEIS	Programmatic Environmental Impact Statement
PV	Photovoltaic
REAT	Renewable Energy Action Team
RMP	Resource Management Plan
ROW	Right of Way
RPS	Renewable Portfolio Standard
RWQCB	Regional Water Quality Control Board
SLC	California State Lands Commission
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USDW	Underground sources of drinking water
USEPA	United States Environmental Protection Agency
WEAP	Worker Environmental Awareness Program

ZLD	Zero liquid discharge

Appendix A:
Regulatory Framework

The renewable energy facility regulatory framework and structure in California is complex. California and the federal government are working toward creating a more efficient process for timely permitting of renewable energy facilities located in the California desert region. The agencies with the main responsibility for designing this accelerated process and that are part of the regulatory framework are The U.S. Department of Interior Bureau of Land Management (BLM) and Fish and Wildlife Service (FWS), California Energy Commission (Energy Commission) and Department of Fish and Game (DFG). These entities are the Renewable Energy Action Team (REAT) management agencies. The framework also includes the California Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR), California State Lands Commission (SLC), California Public Utilities Commission (CPUC), Department of Defense (DOD), local governments, tribal governments, and other federal, state, and regional jurisdictions. Table A, at the end of Appendix A, summarizes federal, state and local government agency authorities and authorizations.

The involvement of any one of nearly 30 federal and state agencies, in addition to tribes, cities, counties and special districts, in the renewable energy regulatory decision-making process depends on the type of facility or technology proposed, project location, and the significance of effects on the environment and human health and safety. As examples:

A. **Thermal electric generating power plants 50 megawatts or larger in size:** The Energy Commission has exclusive power to certify such plants and related facilities for the State of California in lieu of state, regional, and local agencies. Under the California Environmental Quality Act (CEQA), the Energy Commission is the lead state agency. If a project triggers federal agency review the federal lead agency (under the National Environmental Policy Act [NEPA]) varies depending on facility location and required federal permits. Generally, either BLM, the U.S. Environmental Protection Agency (USEPA), a federally recognized tribe, DOD or U.S. Army Corps of Engineers (ACOE) would be the federal lead agency. Often, the Energy Commission and federal lead agency will prepare a joint environmental document. Whether one or two environmental documents are prepared, the Energy Commission and the federal lead agency would consult with DFG, FWS, local governments and other agencies to ensure environmental and health/safety issues are addressed. A few local or state agencies that administer federal laws might issue the federal permits.

B. **Thermal electric generating power plants less than 50 megawatts in size, solar photo voltaic and other non-thermal power plants, like wind farms:** California lead agency status (under CEQA) would depend on project location and required state and/or local approvals. On State-managed lands, likely the SLC would be the lead agency. On private lands, the most likely state lead agency would be a local jurisdiction. The federal lead would vary, as discussed above. Either joint or separate CEQA/NEPA documents are prepared. The CEQA Guidelines encourage preparation of joint documents when state and federal permits are required. The lead agencies would consult with state trustee and responsible agencies (under CEQA), and federal cooperating agencies (under NEPA) during environmental review. Many of the trustee, responsible and cooperating agencies identified for a particular project would issue their required permits after the state environmental document is certified by the lead state lead agency and the federal record of decision on the federal environmental document is issued by the federal lead agency.

C. Geothermal power plants: For power plants 50 megawatts or greater in size, the Energy Commission is the state lead agency for the power plant and related facilities except for steam lines which are under the permitting jurisdiction of the local agency and the geothermal wells which are under the permitting of the DOGGR. For plants that are less than 50 megawatts the state lead agency would vary depending on location and required state /local permits. Regardless of the lead agency responsibility, DOGGR has permitting authority over the geothermal wells and use of wells for injection of geothermal fluids. DOGGR delegated its exploratory geothermal well-permitting authority to Imperial County for wells drilled in that county. The Regional Water Quality Control Boards and Department of Toxic Substance Control share responsibility for regulating management of hazardous wastes. If a federal permit is required for the facility the federal lead agency will vary depending on the required permit(s) and location of the plant.

D. Biomass: For thermal electric power plants, the state lead agency would be determined by the size (less than 50 megawatts: state lead agency would vary depending on land use permitting authority; 50 megawatts or greater: Energy Commission). The federal lead agency would vary, depending on required federal permits and location. The Energy Commission is not responsible for permitting biorefineries, digester or biogas facilities. Therefore the state lead agency for such facilities would depend on state permits required and location. Agencies regulating impacts on sensitive plant and wildlife species, health/safety, air and water quality, pipeline safety, surrounding communities and public service facilities would also issue permits.

E. Electricity transmission facilities: The Energy Commission issues permits for project-related substations and transmission lines between the power plants under its regulatory jurisdiction and the first point of interconnection with the intrastate or interstate electrical grid. Prior to a transmission line being permitted, the California Independent System Operator (CAISO) or other appropriate control agency, such as a publically owned utility, approves a electric transmission interconnection study to identify and address mitigation of adverse impacts on the electrical grid. For transmission lines 200 kilovolts (kV) and larger owned by investor owned utilities (IOU), like Southern California Edison, the CPUC issues Certificates of Public Convenience and Necessity. If the IOU proposes a transmission line between 50 kV and 200 kV, the CPUC issues a Permit to Construct. Publically owned utilities, like the Los Angeles Department of Water and Power, permit and regulate use of their systems. Federal transmission agencies like the Western Area Power Administration are responsible for planning for and permitting their own transmission lines.

Renewable Energy Action Team Management Agencies

Provided below are brief descriptions of the key agencies implementing the California Governor's Executive Order S-14-08 and U.S. Department of Interior Secretarial Order 3285 which focus on development of renewable energy resources.

BLM , http://www.blm.gov/wo/st/en/prog/energy.html - grants rights-of-way (ROW) to construct and operate facilities such as renewable energy power plants and biomass refineries. BLM also issues leases for geothermal energy production, including drilling of the wells, and manages the subsurface activities on BLM managed, U.S. Forest Service administered, and military lands in the Mojave and Colorado Desert regions. Before granting a ROW or issuing a lease, BLM must perform a NEPA review, which considers the project's potential environmental impacts and identifies feasible mitigation measures.

FWS – http://www.fws.gov – provides technical and biological information for use in the NEPA review and document preparation process. Through these efforts, FWS seeks to ensure that impacts to fish and wildlife resources are adequately described and that mitigation needs are met. FWS advises the ACOE and USEPA in their efforts to regulate the discharge of dredged or fill material into waters of the United States. The Federal Endangered Species Act requires FWS to assist other federal agencies in ensuring that any action they authorize, implement, or fund will not jeopardize the continued existence of any federally endangered or threatened plant or animal species. It issues permits for take of federally protected species to federal and non-federal entities. FWS approves habitat conservation plans (HCPs) to allow take of federally listed species and assesses activities proposed on national wildlife refuges for compatibility with the refuge system mission and refuge purpose(s).

DFG – http://www.dfg.ca.gov/about/resource-mgmt.html – is the CEQA Trustee and Responsible agency for fish and wildlife resources and is consulted by the CEQA lead agencies and Energy Commission during preparation of environmental documents. DFG reviews CEQA documents for adequacy of the analyses addressing potentially significant impacts to fish and wildlife resources and recommends mitigation measures where necessary and appropriate. DFG generally has statutory and regulatory responsibility over state listed threatened and endangered species and issues incidental take permits. DFG issues the permits when take of threatened and endangered species cannot be avoided through CEQA document consultations.

DFG generally has statutory responsibility to protect lakes and streambeds. For projects that cross a streambed, bank or channel of any permanent, intermittent, or ephemeral waterway, DFG recommends implementation of techniques that avoid or minimize alterations of the waterways. The recommendations are contained in lake and streambed alteration agreements.

DFG develops natural community conservation plans (NCCPs), as authorized by the Natural Communities Conservation Plan Act. NCCPs identify and provide for regional or areawide protection of plants, wildlife and related habitats, while allowing compatible and appropriate economic activity. When appropriate, DFG will coordinate with federal fish and wildlife agencies in preparing joint state NCCP/HCPs. The Desert Renewable Energy Conservation Planning (DRECP) effort currently underway is an example of such a joint activity.

Energy Commission - http://www.energy.ca.gov/33by2020/index.html - The State of California delegated authority to the Energy Commission to conduct environmental reviews for and license thermal power plants that are 50 megawatts or greater in net generating capacity and appurtenant facilities. For such projects, the Commission's certificate is in lieu of DFG incidental take permits, lake and streambed alteration agreements, and permits or approvals, generally required by other state, local or regional agency. The Commission consults with these agencies to address their issues and concerns. The Secretary for Natural Resources determined the power plant siting process to be functionally equivalent to the CEQA environmental review process.

Memoranda of Understanding/Agreement

Currently federal and state agencies have signed four memoranda that document or clarify their roles concerning regulation of desert renewable energy projects. The signing of a fifth memorandum is in process. The general purpose of the memoranda is to expedite and make the regulatory processes for which the agencies have responsibility more efficient.

Currently, The State of California and U.S. Department of Interior are executing a MOU to further the implementation of Executive Order S-14-08 and Secretary Order 3285 in a cooperative, collaborative and timely manner.

Energy Commission, DFG, BLM and FWS executed a MOU on November 17, 2008 and officially formed their cooperative relationship. The purpose of the MOU is to 1) facilitate coordination between the agencies to develop guidance and a comprehensive conservation strategy (DRECP), 2) help reduce regulatory timelines for siting, development, permitting and construction of qualifying RPS projects in the Mohave and Colorado Desert region, and 3) enhance and maximize environmental protections. One of the objectives of the MOU is to develop Best Management Practices (BMPs) and other appropriate interim guidance to a) assist solar and other qualified RPS energy developers with siting projects in environmentally suitable locations, b) guide development and construction of such projects , and c) to avoid and minimize environmental impacts. The BMPs are to be published by December 31, 2009, prior to completion of the DRECP.

Pursuant to the MOUs REAT agency staff meet weekly to discuss operations related to their renewable energy responsibilities. Agency staff also meet bimonthly with project developers.

The Energy Commission and DFG signed another MOU on November 17, 2008 to 1) guide their participation in the REAT and 2) create a more efficient process for permitting renewable energy generation power plants and transmission lines under California law. They agreed to develop and publish a BMP manual to assist RPS project applicants in designing projects to emphasize siting considerations and minimize environmental impacts for RPS desert projects.

The Energy Commission and BLM executed a MOU in 2007 that documents their relative roles, responsibilities and procedures to follow in conducting joint environmental reviews of solar thermal power plant projects. The MOU also describes how they resolve disputes. For power plants under the Energy Commission's jurisdiction and that are proposed on federally managed land, the BLM and Energy Commission will prepare joint federal and state environmental impact documents before granting a ROW and issuing a lease and license.

The Energy Commission and SLC, http://www.slc.ca.gov/, are executing a Memorandum of Agreement (MOA) to ensure timely and effective coordination between the two state agencies during the Energy Commission's review of an Application for Certification (AFC) on lands under SLC's jurisdiction and during issuing of SLC leases for power plants not subject to the Energy Commission's jurisdiction. Generally, these non-jurisdictional power plants include those that are smaller than 50 MW, solar photovoltaic power plants, and wind energy projects of any size. Also, the Energy Commission does not have jurisdiction over drilling of geothermal wells, bio fuel refineries, digester and landfill gas facilities. SLC issues leases for renewable energy facilities and other types of development on state-owned lands under its jurisdiction (SLC lands). The SLC generally conducts a California CEQA review before issuing the lease or a geothermal prospecting permit for wells on SLC lands. The MOA describes the manner in which the two Commissions and their staffs will coordinate during AFC reviews and during consultation on power plant proposals requiring a SLC lease, but are not under the jurisdiction of the Energy Commission.

For plants under the Energy Commission's jurisdiction that are proposed on SLC lands and for which a SLC decision is required, SLC will use the Energy Commission prepared environmental document in the same manner it would use a CEQA document prepared by a lead agency, unless a subsequent or supplemental document is appropriate. If the Energy Commission document does not meet CEQA guidelines criteria, SLC will act as a lead agency and prepare the appropriate environmental document. Energy Commission staff will consult with and provide advice to SLC staff on siting and compliance issues related to power plants outside the Energy Commission's jurisdiction for which SLC has regulatory responsibility.

Other Agencies and Policies

DOGGR, http://www.conservation.ca.gov/dog/geothermal/Pages/index.aspx. regulates how geothermal wells are drilled, operated, maintained and abandoned on non-federal and non-tribal lands. The Department of Conservation proposed new regulations for geothermal well drilling, production and injection operations in California, which address well spacing, casing requirements, blowout prevention, environmental protection, injection, subsidence, and plugging and abandonment. The regulations can be accessed at ftp://ftp.consrv.ca.gov/pub/oil/geothermal/New_Geothermal_Regs.pdf.

The CPUC, http://www.cpuc.ca.gov/PUC/energy permits certain renewable energy power plant, system, and transmission line infrastructure projects. The CPUC reviews permit applications from investor-owned utilities under two concurrent processes: 1) an environmental review pursuant to CEQA and 2) review of project need and costs (Certification of Public Necessity and Convenience or Permit to Construct). It also approves investor owned utility procurement contracts for electricity generated by renewable energy resources.

In coordination with the Federal Railroad Administration the CPUC ensures railroads comply with federal railroad safety regulations. The CPUC investigates railroad accidents and responds to safety related inquiries made by community officials, the public and railroad labor organizations.

The CAISO, http://www.caiso.com, is a nonprofit public benefit corporation charged with operating the majority of California's high voltage wholesale power grid. CAISO is the link between power plants and utilities that serve more than 30 million consumers. CAISO provides equal access to the grid for qualified users and strategically plans for the needs of the electricity transmission infrastructure.

In the desert region many renewable energy facilities will be sited near or adjacent to DOD military installations or under aircraft low fly zones. The BLM, other agencies, and project proponents generally consult with the appropriate military representatives. Additionally, the Energy Commission will recommend a joint NEPA/CEQA environmental review process with the DOD when a proposed power plant falls under the jurisdiction of the Commission.

Local Jurisdictions

Cities, counties and special districts conduct CEQA environmental impact and mitigation analyses prior to permitting power plants smaller than 50 MW, solar photovoltaic power plants, wind energy projects of any size, geothermal wells and many biomass facilities on privately owned or locally managed land. As lead agencies they use the environmental documents during their local permitting and regulatory processes.

Local agencies generally follow their general plans and zoning ordinances when making decisions on proposed projects. The general plans and ordinances address land use, transportation, conservation, open space, greenhouse gas impacts, safety and noise.

Optional issues that may be addressed in general plans include energy or specific types of energy development. County governments may have an adopted geothermal element. These elements generally consist of a statement of geothermal development policies, including a diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals. The content includes a discussion of environmental damages and identification of sensitive environmental areas, including unique wildlife habitat, scenic, residential, and recreational areas. Local governments, like Imperial County, may require that project developers consider how noise levels from energy facilities may affect wildlife, as well as humans.

Local governments may also assume responsibility delegated by a state regulatory agency. For example, DOGGR delegated its exploratory geothermal well-permitting authority to Imperial County, http://www.co.imperial.ca.us/planning/planning_div/ceqa/ceqarul2.pdf, for such wells drilled in the county's jurisdiction. DOGGER retained jurisdiction over production and injection-well drilling and operations. Imperial County has a CEQA categorical exemption for installing and operating geothermal temperature gradient wells for locating geothermal resources.

Table A: Renewable Energy Facility Authorizations – Summarized

Permits/Licenses/Consultations/Leases/Agreements/Certifications		
Federal/Native American Nations	**State/Regional**	**Local**
Advisory Council on Historic Preservation -Impacts on Listed, Historic Structures (National Historic Preservation Act) **Army Corps of Engineers** -Section 10 (Rivers & Harbors Act) -Section 404 (Clean Water Act) -Nationwide (Clean Water Act) **Bureau of Indian Affairs** -Government-to-Government Consultations with Indian Tribes (Tribal Treaties) -Government-to-Government Consultations with Indian Tribes (Tribal Treaties) **Bureau of Land Management** -Right-of-Way (Mineral Leasing Act, Section 28; Federal Land Policy & Management Act, Title V; Energy Policy Act, Section 211) -Land Leases (Federal Land Policy & Management Act of 1976; Energy Policy Act, Sections 222, 225) **Department of Defense** -Consultations with regulatory agencies & project developers (Energy Policy Act; National Environmental Policy Act) **Department of Transportation** -Hazardous Liquid Pipeline Special Permits (Hazardous Liquid Pipeline Safety Act of 1979, as amended)	**Air Quality Management Districts** (35) -New Source Review (Clean Air Act; CA Health & Safety Code, Division 26; CA Public Resource Code, Division 13, Local Agencies) **Air Resources Board** -Statewide Portable Equipment Registrations Program (Clean Air Act; CA Health & Safety Code) **Caltrans** -Encroachment (Streets & Highway Code) **Department of Conservation, Division of Oil, Gas, and Geothermal Resources** - Geothermal well drilling (CA Public Resources Code, Division 3, Chapter 4) -Lead agency – exploratory drilling projects on private & state lands (CA Public Resources Code 3715.5; CA Environmental Quality Act) **Department of Fish & Game** -Incidental Take (CA Endangered Species Act; CA Fish & Game Code 2080.1, 2081(b); CA Code of Regulations 873.0 et seq.) -Threatened & Endangered Species (CA Endangered Species Act; CA Environmental Quality Act; CA Code of Regulations 15000 et seq)	**Airports** -Encroachment (CA Public Resources Code, Division 9) -See Cities/Counties, above -Land Use (CA Coastal Act) **Bureaus of Sanitation** -Industrial Wastewater Discharge **Cities/Counties** (CA Government Code) -Encroachment -Land Use -Safety -Grading -Plumbing -Electrical -Public Works -Noise -Environmental Health -Building -Hazardous Substances Spill Response Plans (40 CFR 300) -Land Use (CA Public Resources Code, Division 6) **Fire Departments** -Hazmat (CA Constitution, Article XI, Section 7) -Above Ground Storage of Hazardous/Flammable Materials -Hazardous Materials Business Plan

-Hazardous Liquid Pipeline Approvals (Hazardous Liquid Pipeline Safety Act of 1979, as amended) **Environmental Protection Agency** -National Pollution Discharge Elimination System (Clean Water Act) -New Source Review (Clean Air Act) **Federal Aviation Administration** -Proposed Construction or Alteration of Objects That May Affect Navigable Airspace **Federal Energy Regulatory Commission** - Transmission lines in national corridors (Energy Policy Act) **Fish & Wildlife Service** -Use in national wildlife refuges (Fish & Wildlife Coordination Act) -Threatened & Endangered Species, Migratory Birds, Water Resources & Quality (Endangered Species Act; Migratory Bird Treaty Act; Fish & Wildlife Coordination Act) **Forest Service** -Special Use Authorizations (Mineral Leasing Act, Section 28) **Lead Agency** -Record of Decision (National Environmental Policy Act) **National Park Service** -Right-of-Way (The Organic Act) **Native American Tribal Governments** -Analogous to many Federal environmental permits (Tribal Treaties) **Native American Tribal Monitors** -Consistency with National Historic Preservation Act	-Lake & Streambed Alteration Agreement (CA Fish & Game Code 1600 et seq) **Department of Toxic Substance Control** -On-site Hazardous Waste Generation (Resource Conservation & Recovery Act; Hazardous Waste Control Law) **Energy Commission** -Thermal Power Plant Certification (Warren-Alquist Act) **Independent System Operator** -Electric Transmission Interconnection Study Approvals (Federal Power Act, Section 205; Federal Energy Regulatory Commission regulations Section 35.13; CA Public Utilities Act) **Lead Agency** -Certification (CA Environmental Quality Act) **Occupational Safety & Health Administration** [Cal OSHA] -Construction related (29 CFR 910.95) **Public Utilities Commission** -Permit to Construct (Public Utilities Code 1001 to 1013; CA Environmental Quality Act) -Tariffs & Terms of Service (CA Public Utilities Code) -Certification of Public Necessity & Convenience (Public Utilities Code 1001 to 1013; CA Environmental Quality Act) **Regional Water Quality Control Boards** (9) -National Pollution Discharge Elimination System (Clean Water Act; CA Porter Cologne Water Quality Control Act; CA Water Code Section 13000 et seq.) -401 Certification (Clean Water Act) **State Fire Marshal, Office of Pipeline Safety**	**Lead Agency** -Certification (CA Environmental Quality Act) **Resource Conservation Districts** -Assistance for controlling soil, erosion/runoff, stabilizing soils & improving water quality (CA Public Resources Code) **Special Districts** – Examples: Water, Flood Control, Irrigation Districts -Encroachment (esp. for water crossings) (CA Public Resources Code, Division 9)

	(U.S. Department of Transportation Agent) -Design of leak protection system -Cathodic protection -Pipeline Wellhead Protection Plan (49 CFR 190; 49 CFR 195; 40 CFR; Oil Pollution Act; Public Law 101-380; CA Government Code 51010-51019.1) **State Historic Preservation Officer** -Section 106 (National Historic Preservation Act) **State Lands Commission** -Land Lease (CA Public Resources Code, Division 6)	

1

2

Appendix B:
Desert Renewable Energy Facility Technologies

In the desert region, the renewable energy resources of interest include solar, wind, geothermal and biomass. Utility scale renewable energy projects include facilities that collect the energy source and convert it into electricity and the appurtenant facilities like cooling systems (for thermal electric generating facilities), access roads, pipelines and transmission lines. These facilities differ in design depending on the type of proposed renewable energy resource and the technology used to generate the electricity.

Solar

Solar energy technologies potentially suitable for use in utility-scale applications include concentrating solar power (CSP) and photovoltaic (PV). Use of either technology requires large areas, often thousands of acres, for solar radiation collection. For example, a 200 megawatt concentrating parabolic trough solar thermal power plant will generally require 2 square miles or 1,280 acres of land.

Concentrating Solar Power Technologies

CSP technologies use mirrors to concentrate (focus) the sun's light energy and convert it into heat to create steam to drive a turbine that generates electrical power. The power plants consist of two parts: one that collects solar energy and converts it to heat, and another that converts the heat energy to electricity. Within the United States, CSP plants have operated reliably for more than 15 years.

CSP plants are thermal electric generating power plants and thus produce waste heat that must be dissipated to the atmosphere. Some use forced-draft wet cooling towers that release the waste heat to the ambient atmosphere by the evaporation of water. Forced draft wet cooling towers use large fans to provide air movement upward through falling water and are rectangular, box-like structures. In desert areas, dry cooling radiators are preferred by agencies, since water is scarce and could be used for residential, agricultural, commercial, environmental or other industrial uses for which there are no or fewer water source alternatives. Dry cooling radiators also use large fans to draw air through the radiator to reject the waste heat. Dry cooling towers have lower efficiency and higher energy consumption than wet, evaporative cooling towers, due to the required fans. In the desert, use of dry cooling can decrease plant efficiency by three to six percent, when compared to efficiencies of plants using wet cooling technologies.

Generally, there are four types of concentrating solar thermal technologies expected to be sited in the desert region. They are: parabolic trough, power tower, power trough, and dish/engine systems.

Parabolic trough systems use large, curved (parabolic) reflectors (focusing mirrors) that have oil-filled pipes running along their focal point, as shown in Figures 1 and 2. The mirrored reflectors track the sun on a single axis and focus sunlight on the pipes to heat the oil inside to as much as 750°F. The hot oil is sent to a heat exchanger to heat water into high temperature steam to run conventional steam turbines and generators.

Figure 1: Parabolic Trough Diagram

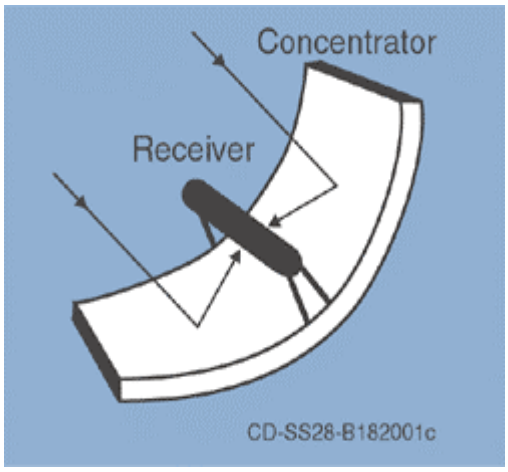


Figure 2: Parabolic Trough System

Source: http://solareis.anl.gov/guide/solar Source: California Energy Commission 2009

Power tower systems, also called central receivers, use many large, flat heliostats (mirrors) to track the sun on two axes and focus its rays onto a receiver. As shown in Figures 3 and 4, the receiver sits on top of a tall tower in which concentrated sunlight heats water into steam or a fluid, such as molten salt, to temperatures as hot as 1,050°F. The molten salt can be used immediately in a heat exchanger to make high temperature steam for electricity generation, or it can be stored for later use. Molten salt retains heat efficiently, so it can be stored for hours and possibly up to two to three days before being converted into electricity. That means electricity can be produced during periods of peak need on cloudy days or even several hours after sunset.

Figure 3: Power Tower Diagram

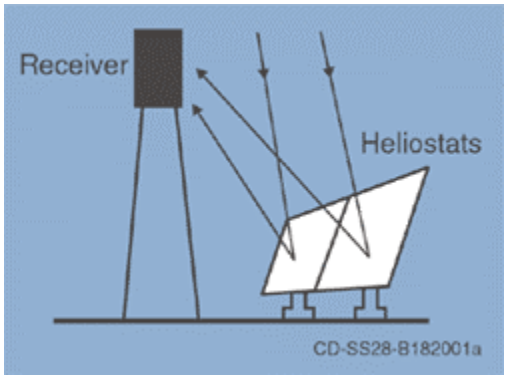
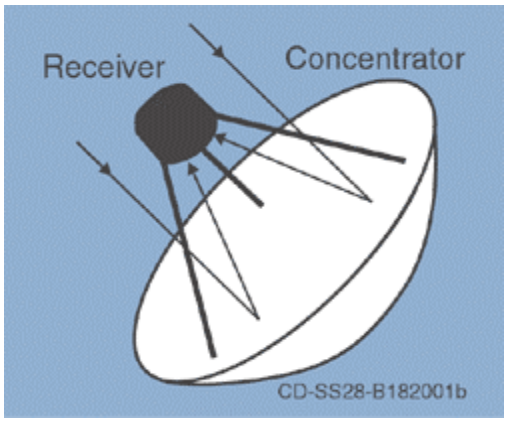


Figure 4: Power Tower System

Source: http://solareis.anl.gov/guide/solar Source: California Energy Commission 2009

Dish/engine systems use mirrored dishes from 20 to 40 feet across to focus and concentrate sunlight onto a receiver. As shown in Figures 5 and 6, the receiver is mounted at the focal point of the dish. To capture the maximum amount of solar energy, the dish assembly tracks the sun across the sky on two axes. The receiver is integrated into a high-efficiency "external" combustion engine. The engines use hydrogen or helium gas as the working fluid to move a piston(s) to generate electricity. The receiver, engine, and generator comprise a single, integrated assembly mounted at the focus of the mirrored dish.

Figure 5: Dish System Diagram



Source: http://solareis.anl.gov/guide/solar

Figure 6: Solar Dish System

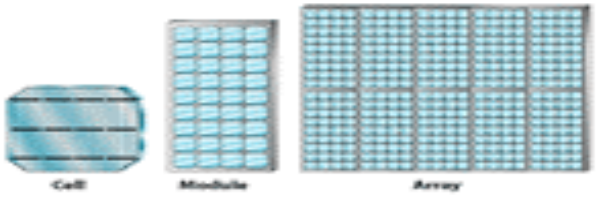
Source: California Energy Commission 2009

Solar Photovoltaic (PV) Technologies

Solar cells convert sunlight directly into electricity and are made of layers of semiconductor materials similar to those used in computer chips. When sunlight is absorbed by these materials the solar energy knocks electrons loose from the atoms, allowing the electrons to flow through the material to produce electricity. PV systems do not use steam generators and thus do not require thermal cooling equipment.

Flat-plate PV arrays are comprised of solar cell modules. Solar cells are generally very small, and each may only be capable of generating a few watts of electricity. They are typically combined into modules of about 40 cells; the modules are in turn assembled into PV arrays up to several meters on a side as shown in the following figure.

Figure 7: Solar cell, module, and array



Source: http://solareis.anl.gov/guide/solar

These PV arrays can be mounted at a fixed angle facing south or they can be mounted on a tracking device that follows the sun, allowing them to capture more sunlight. For utility-scale electricity generating applications, hundreds of arrays are interconnected to form a single, large system.

Thin film PV arrays are similar in all outward appearances to flat-plate PV arrays. Traditional solar cells are made from silicon, are usually flat-plate, and generally are the most efficient. Second-generation solar cells are called thin-film solar cells because they are made from amorphous silicon or nonsilicon materials such as cadmium telluride. Thin film solar cells use layers of semiconductor materials only a few micrometers thick.

Figure 8: Thin Film Solar Array

Source: http://www.nrel.gov/learning/re_photovoltaics.html

Concentrated PV (CPV) systems concentrate sunlight on solar cells, greatly increasing the efficiency of the cells. The PV cells in a CPV system are built into concentrating collectors that use a lens or mirrors to focus the sunlight onto the cells. CPV systems must track the sun to keep the light focused on the PV cells.

Figure 9: CPV Solar arrays

Source: California Energy Commission 2009

Wind

Modern wind energy development uses utility-sized turbines that typically range from 100 kilowatts up to 5 megawatts to convert the wind's kinetic energy to electricity. These turbines primarily are grouped into large wind farms, which produce power for the electric grid.

The following description summarizes information from the National Renewable Energy Laboratory, http://www.nrel.gov/learning/re_wind.html. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a rotor. A blade acts much like an airplane wing. When the wind blows, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. This is called lift. The force of the lift is actually much stronger than the wind's force against the front side of the blade, which is called drag.

The combination of lift and drag causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity.

The largest installed wind turbines in the country can stand up to 300 feet tall and have rated capacities of up to 5 MW. The largest wind turbines installed in the California desert to date are 2.5 MW and about 250 in height, each, at the Edom Hill Wind Farm near Palm Springs; the farm was recently repowered and is 20 MW in size. Within each rated capacity, the length of the blades and height of the towers will vary according to site-specific location and wind-speed needs. Larger, taller turbines capture winds at higher elevations and are more powerful because of the larger swept-area of the blades. Advances in technology, including state-of-the-art control systems and advanced composite materials, also lead to increased productivity.

Wind energy development, also called "wind farms," typically occur on ridgelines, mountain pass areas, foothills or flatter, open desert lands to take advantage of the higher wind speeds. The farms include roads, buildings, equipment yards, electrical substations and related transmission lines.

Figure 10: Wind Farm on Campo Kumeyaay Indian Reservation in San Diego County, California (each turbine generates 2 MW)

Source: California Energy Commission 2009

Geothermal

Geothermal energy is accessed by drilling hot water or steam wells in a process similar to drilling for oil. Geothermal energy is an enormous heat and power resource that emits little or no greenhouse gases and is reliable (average system availability of 95%) http://www1.eere.energy.gov/geothermal/geothermal_basics.html.

The depth and type of geothermal resources range from shallow (just below the ground surface), to hot water and rock several miles below the ground surface. Deep wells can be drilled a mile or more into underground reservoirs to tap steam and very hot water that can be brought to the surface for use in a variety of applications such as to drive turbines that drive electricity generators.

In the desert the following types of geothermal power plants are operating or could be proposed:

- Flash steam plants, which pull deep, high-pressure hot water into lower-pressure tanks and use the resulting flashed steam to drive turbines. Most operating geothermal power plants use flash steam technology.

- Binary-cycle plants, which pass moderately hot geothermal water by a secondary fluid with a much lower boiling point than water. This causes the secondary fluid to flash to vapor, which then drives the turbines.

Figure 11: Coso Hot Springs Double Flash Steam Geothermal Power Plant

Source: Jim Perry, BLM 2009

Geothermal Power Plant Cooling Systems

Like all steam-turbine generators, geothermal power plants use condensers to remove excess heat from turbine exhaust and convert it from steam to a liquid. This heat transfer is accomplished with use of air or water.

Some binary-cycle geothermal power plants are air cooled because insufficient water is available to provide year-round water cooling (C. Kutscher and D. Costenaro 2002). The performance of air-cooled geothermal plants is highly dependent on the ambient air temperature (much more so than fossil fuel plants that operate at higher boiler temperatures). Most air cooling systems use noisy fans to cool the air, but noise can be reduced by use of quieter, albeit more expensive, fans. Plant electric output can drop by 50 percent or more on hot summer days, compared to winter performance. The problem of reduced summer performance is exacerbated by the fact that electricity has a higher value in the summer.

Data from the Salton Sea weather station in Imperial County,[5] where many geothermal power plants are expected to be built, show ambient air temperatures typically exceed 100° F every day in June through September. When hourly temperatures are hottest, relative humidity is lowest: 24 to 35 percent. In such an extreme hot, dry climate, geothermal power plants can only maintain their power output with water cooling.

Water-cooled systems use cooling towers to reject heat collected from the condenser. Cooling towers reject heat by evaporation, so more than half of the water is lost to the environment (consumed) and must be replenished continuously. The remainder of the water is injected back into the system. The temperature of the geothermal resource determines how much

[5] Temperatures and relative humidity are five-year averages calculated from California Irrigation Management Information System for Salton Sea East weather station, http://wwwcimis.water.ca.gov/cimis/frontStationDetailInfo.do?stationId=128. In July and August, temperatures exceed 100° F at least seven hours daily and in June and September, they exceed 100° F for two to three hours daily. Data available upon request.

water is consumed by wet-cooled geothermal power plants. Recent literature (U.S. Department of Energy, 2006 and Western Resource Advocates, 2008) states that cooling such plants requires in the range of 1,400 to 1,700 gallons of water for each megawatt hour produced. For a 50 MW power plant with a 90 percent capacity factor that delivers about 384,000 megawatt hours of electricity, a hybrid air (fall, winter and spring) and closed-cycle water (used in summer only) cooling system could have a water requirement in the range of about 400 to 500 acre feet per year. Sources of cooling water could include: fresh surface or ground water, brackish water, degraded water, or recycled wastewater. All flash and some binary-cycle power plants use water cooled systems. For projects where water cooling is essential to the plant's operation, use of nonfresh water is preferred.

Geothermal Fluids

Geothermal fluids contain a variety of chemicals and if they contain high concentrations of salts they are called geothermal brines. In addition to its major constituents – sodium, chloride, potassium, and calcium – geothermal brine may contain metals and metalloids (semiconductors) including arsenic, barium, boron, lithium, magnesium, silica, strontium, and zinc. Radioactive elements, radium and radon, are also found in geothermal brines. Exact composition depends on local geology.

Once geothermal brines are "produced" by drilling wells, they create potential storage and disposal problems because the heavy metal is hazardous in toxic concentrations. Binary geothermal power plants avoid these problems by retaining brines within a closed loop system so that all geothermal brine used in power production is reinjected back underground at a sufficient depth to protect groundwater quality. Flash geothermal power plants, however, expose brine to the environment when they direct geothermal steam to the power plant's turbines.

As the geothermal brine cools, suspended and dissolved solids precipitate out of solution and create scale-formation problems for power plant and injection-well operators. Flash geothermal power plants can control scale formation by adding acid to elevate pH levels or by "seeding" the brine to force precipitation to occur before, rather than after, the geothermal steam enters the turbine. Liquid wastes (including spent brine, steam condensate, and cooling tower blowdown) from geothermal power plants are reinjected underground, but the precipitated solids must be diverted to a filtering and dewatering process and then formed into "filter cakes." These "filter cakes" are stored in an enclosed space before their transfer to a permanent landfill.

Despite efforts to limit scale formation, some scale still deposits on the walls of power plant equipment, pipelines, and injection wells. Plant operators use high pressure hoses to "hydroblast" these hard deposits from equipment surfaces. The equipment is then returned to use. The runoff from "hydroblasting" must be channeled to a surface impoundment to prevent soil contamination by arsenic, lead and other heavy metals.

Surface impoundments are used to:

- Temporarily retain geothermal brines prior to re-injection.
- Temporarily hold geothermal brines from cleanup of any unauthorized spills or releases.
- Hold solids that have fallen out of the geothermal brines during the process.
- Retain cooling tower blowdown during emergency situations and maintenance operations prior to reinjection.

Routine testing determines whether the composition of geothermal filter cakes, drilling mud, and scale is hazardous or just contains "designated" wastes not acceptable by municipal landfills. In Imperial County, the Monofill Facility is dedicated to receiving non-hazardous solid waste from eight nearby geothermal power plants. The facility may accept up to 750 tons per day of the following waste streams: drilling muds and cuttings from construction/reconstruction of geothermal production and injection wells; geothermal filter cake, resulting from filter press operations at geothermal power plants; geothermal material-contaminated soil; and, incidental plastic sheeting/materials used in transfer vehicles. The facility may also receive the following waste streams after the streams have been characterized as non-hazardous by a California certified laboratory: canal water solids, back wash solids, resin solids, and miscellaneous sludges from mineral recovery facilities; geothermal filter cake sulfur; and lime waste residue.

Reinjection of Geothermal Fluids

Injection wells can provide a safe disposal of geothermal fluids, if properly designed and sited. In California, the Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) allows three types of fluid to be disposed of by geothermal injection wells:

- Spent geothermal fluids (for example, heat-depleted water from a binary turbine and unflashed geothermal fluid from a flash system's separator)
- Condensate and other DOGGR-approved fluids from power plant operations (for example, drilling waste fluid and cooling tower blowdown)
- DOGGR-approved supplemental water used to enhance geothermal field production

Potential problems with injecting geothermal waste fluids have been identified by Sanyal et al, 1995, including: cooling of the produced fluid, excessive injection pressure, loss of steam well productivity, groundwater contamination, ground heaving, leakage of injection fluid to the surface, adverse impact to the produced fluid's chemistry, induced seismic activity.

Provided suitable injection sites exist, most problems can be avoided by means of careful siting of injection wells based on exploration, well testing and conceptual modeling of the reservoir, and through proper well design and prudent field operation.

Biomass

Biomass generally refers to organic material from plants and animals, including agricultural and municipal solid waste (MSW) and landfill products. More information can be found at http://www.bioenergywiki.net/index.php/Bioenergy.

Biomass energy facilities need a sufficient and reliable feedstock to ensure economic viability. In the desert region, there is little availability of forest or agricultural feedstocks, except possibly in Imperial County. Population densities are also less than in other areas of the state, which results in fewer potential sites for biomass energy facilities. Therefore, no more than a few such facilities are expected.

At present, biofuel refineries (also called biorefineries) associated with MSW landfills and biogas facilities associated with dairies and landfills could be developed in the California desert. The Energy Commission funded a dairy digester operation in the desert region of San Bernardino county and the project is currently operating. Biorefineries would take woodchips, yard clippings and other usable garbage from landfills and convert them to ethanol.

Figure 12: Biofuel Refinery

Source: Google Images 2009

MSW Conversion

MSW conversion technologies use advanced thermal, biological or chemical processes to convert the carbon-based portion of the MSW stream into a synthetic gas (syngas) which is then used to produce electricity, chemicals, and / or fertilizers.

It is possible MSW to energy power plants will be proposed in the California desert by project developers. Power plants that use MSW derived fuels may be eligible for Energy Commission Renewable Portfolio Standard (RPS) certification. The certification criteria allow use of a non-combustion thermal process to convert MSW to clean burning fuel to generate electricity. Use of air in the conversion process is limited to temperature control, only. In addition the process 1) cannot produce air contaminants or emissions, surface or groundwater discharges or hazardous wastes and 2) must remove recyclable materials and green waste before conversion of the material to a biofuel. Plants produce electricity, only, or produce steam and electricity (Combined Heat and Power) where there is a nearby need for process steam.

Digester Gas / Biogas Type Facilities

Biomass that is high in moisture content, such as animal manure, sewage, landfill material, and food-processing wastes, is suitable for producing biogas using anaerobic digester technology.

Anaerobic digestion is a biochemical process in which particular kinds of bacteria digest biomass in an oxygen-free environment. Several different types of bacteria work together to break down complex organic wastes in stages, resulting in the production of "biogas." The biogas produced in a digester (also known as "digester gas") is a mixture of gases, with methane and carbon dioxide making up more than 90 percent of the total. Biogas typically contains smaller amounts of hydrogen sulfide, nitrogen, hydrogen, methylmercaptans and oxygen.

Agricultural Waste Products

Agricultural biogas technology is a manure management tool that promotes the recovery and use of biogas as energy by adapting manure management practices to collect biogas. The biogas can be used as a fuel source to generate electricity for on-farm use or for sale to the

electrical grid, or for heating or cooling needs. The biologically stabilized byproducts of anaerobic digestion can be used in a number of ways, depending on local needs and resources. Successful byproduct applications include use as a crop fertilizer, bedding, and as aquaculture supplements.

A typical agricultural biogas system consists of the following components: manure collection, anaerobic digester, effluent storage, gas handling, gas use, and solids disposal / reuse,

Municipal Sewage

Municipal sewage also contains organic biomass solids, and many wastewater treatment plants use anaerobic digestion to reduce the volume of these solids. Anaerobic digestion stabilizes sewage sludge and destroys pathogens. Sludge digestion produces biogas containing 60 percent to 70 percent methane, with an energy content of about 600 Btu per cubic foot. Utility delivered natural gas has an approximate energy content of 915 Btu per cubic foot.

Most wastewater treatment plants that use anaerobic digesters burn the gas for heat to maintain digester temperatures and to heat building space. Unused gas is either burned off as waste or could be used for fuel in an engine-generator or fuel cell to produce electric power.

Landfill Gas-to-Energy

The same anaerobic digestion process that produces biogas from animal manure and wastewater occurs naturally underground in landfills. Most landfill gas results from the decomposition of cellulose contained in municipal and industrial solid waste. Unlike animal manure digesters, which control the anaerobic digestion process, the digestion occurring in landfills is an uncontrolled process of biomass decay. When bacteria consume the biodegradable wastes in landfills, they produce landfill gas containing methane, carbon dioxide, and non-methane organic compounds. Of these major constituents, only the methane gas has value as a power plant fuel.

The efficiency of the process depends on the waste composition and moisture content of the landfill, cover material, temperature and other factors. The biogas released from landfills, commonly called "landfill gas," is typically 50-percent methane, 45-percent carbon dioxide and 5-percent other gases. The energy content of landfill gas is 400 to 550 Btu per cubic foot.

Capturing landfill gas before it escapes to the atmosphere allows for conversion to useful energy. A landfill must be at least 40 feet deep and have at least one million tons of waste in place for landfill gas collection and power production to be technically feasible.

A landfill gas-to-energy system consists of a series of wells drilled into the landfill. A piping system connects the wells and collects the gas. Dryers remove moisture from the gas, and filters remove impurities. The gas typically fuels an engine-generator set or gas turbine to produce electricity. The gas also can fuel a boiler to produce heat or steam. Further gas cleanup improves biogas to pipeline quality, the equivalent of natural gas. Reforming the gas to hydrogen would make possible the production of electricity using fuel cell technology.

In California, landfills of a minimum size are required to have landfill gas collection and monitoring systems for public safety and environmental reasons. If methane gas migrates beyond a landfill's boundary, it poses a potential public safety risk. Specifically, methane is flammable when its concentration in air is between five and 15 percent and it encounters a strong ignition source. If methane gas collects within a building, sewer, or other enclosed space and then ignites, it can explode. The California Integrated Waste Management Board

developed Best Management Practices for monitoring the buildup and migration of methane gas from landfills.[6]

Non-methane organic compounds may be controlled by either flaring the landfill gas or capture and process for sale to industrial users. Developing a landfill gas to energy project is a strategy for addressing these environmental and public safety issues.

Electricity Transmission

Renewable energy development requires a variety of infrastructure facilities to enable the generated energy (electricity) to be delivered (transmitted) to load centers often a great distance from the site of generation.

Collection systems typically link the multiple generators to a central transformer. The links typically are underground cables to a pad mounted step-up transformer. These transformers increase the voltage to usually 12, 000 volts. From this transformer, the voltage is then carried on low-voltage (12 kilovolt [kV]) overhead lines to an on-site substation so that it can be stepped up again to a voltage level required by the utility.

Substations are the facilities that step up the generated voltage from the renewable energy development to a voltage required by the utility. The substation can range in size from an acre to as many as 40 acres depending on the amount of equipment used. The entire substation is level-graded, fenced or walled with gravel covering the entire site. All components are mounted on reinforced concrete pads. The site is designed with a stormwater drainage component to prevent water pooling and electrocution hazards. A cluster of remote renewable energy developments would likely feed a substation via collector lines that will vary in length.

The types of equipment usually present in a high voltage substation include: transformers, circuit breakers, filters, potential transformers, voltage and current controlling equipment and transmission tower structures. Additionally, the entire site has a copper grounding grid, typically no less than 18 inches below the grade.

Figure 13: Imperial Valley Substation near El Centro, California

[6] See Landfill Gas Control and Monitoring: Best Management Practices for Landfill Gas Monitoring Well/Probe Construction at http://www.ciwmb.ca.gov/leaCentral/LandfillGas/Monitoring/BMPWellConst.htm.

Transmission Line Interconnections

Renewable energy developments connect to high-voltage transmission lines in the same manner as fossil-fueled power plants. The connection to the electric transmission grid is called the first point of interconnection.

The first point of interconnection is determined on the location of the electrical generating station(s) relative to the transmission system. Where a development is in close proximity adjacent to a utility substation, a few poles are needed to make the connection.

Often a power plant developer will construct a substation as part of the development and connect the project to the nearest transmission line capable of accepting the voltage. In this instance the line could be as short as a few hundred feet or several miles long.

Transmission Lines

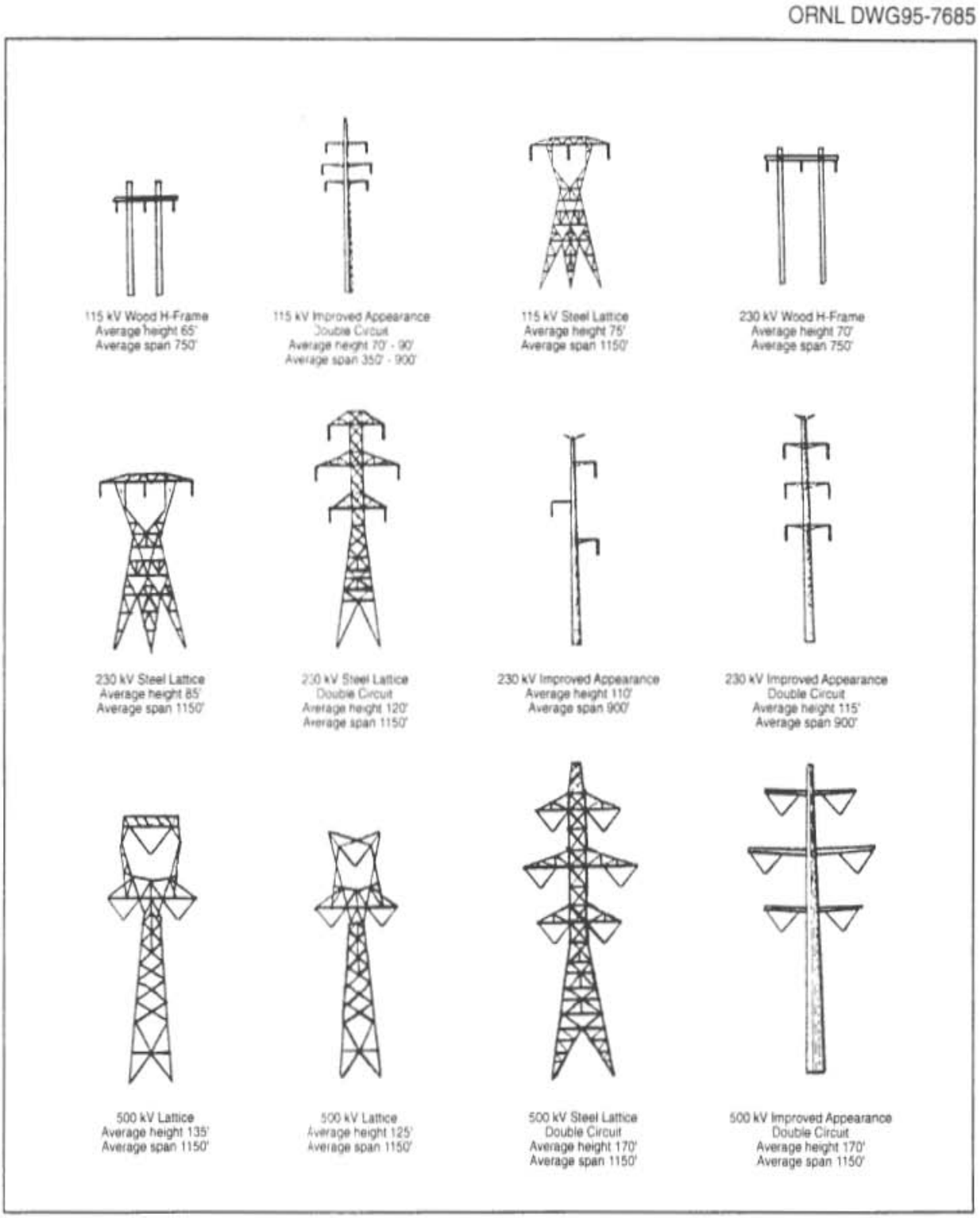
The electric power system can be divided into the distribution, subtransmission, and transmission systems. With operating voltages less than 34.5 kV, the distribution system carries energy from the local substation to individual households, using both overhead and underground lines. With operating voltages of 69-138 kV, the subtransmission system distributes energy within an entire district and regularly uses overhead lines. With operating voltage exceeding 230 kV, the transmission system interconnects generating stations and large substations located close to load centers, like cities, by using overhead lines.

Transmission lines and structures are designed for the environmental and operating conditions that are common for the geographic area of use. Most lines require a right-of-way (also called an easement) of up to 300 feet or more in width for multiple transmission lines, maintenance / access road(s), and laydown areas for construction.

Different types of towers or poles are used to carry the wires. The structure type and height is dependent on the voltage rating, distance between towers, number of circuits (each line has at least one, some may have two), and the locale such as mountains, forest, river crossings, seismicity, urban, rural, or open terrain. The materials for the structures include pressure-treated wood pole, both single and H-frame, steel pole, and steel lattice towers.

Due to environmental and economic concerns, reconductoring or rebuilding a transmission line is always preferred over expanding existing rights-of-way or creating new rights-of-way to build new transmission lines. Examples of the different configurations and average height and span between towers are shown in Figure 14 below.

Figure 14: Transmission Line Structures



Source: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1437/v1/fig005.html.

1

2

Appendix C: List of Informational Resources and Internet Links

Agricultural Resources

California Land Evaluation and Site Assessment (LESA), California Department of Conservation, *Land Resource Protection Unit, LESA website--* *http://www.consrv.ca.gov/DLRP/qh_lesa.htm*.)

Prime Farmland, Unique Farmland, or Farmland of Statewide Importance *California Department of Conservation, Land Resource Protection Unit, Farmland Mapping and Monitoring Program website--* *http://www.conservation.ca.gov/DLRP/fmmp/index.htm*

United States Department of Agriculture, Natural Resources Conservation Service, Conservation Programs website *http://www.nrcs.usda.gov/Programs/*.)

Airport Compatibility

Federal Aviation Administration Western Pacific Regional Office, the regional Airport Land Use Commission, the city/county planning department, the manager of the airport)

Air Quality

California Air Resources Board website *http://www.arb.ca.gov/desig/adm.htm,and the California Air Resources Board Community Health Air Pollution Information System (CHAPIS) website* *http://www.arb.ca.gov/gismo/chapis_v01_6_1_04/*.

Also contact the local air quality management district and California Energy Commission Air Quality Unit

Atmospheric Extremes and Dispersion

NOAA Satellite and Information Service, National Climatic Data Center, National Environmental Satellite, Data, and Information Service website *http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwAW~MP~F.)*

Biological Resources

Federal or state habitat conservation or management area, contact *the regional office of the United States Fish & Wildlife Service, California Department of Fish & Game, the city/county planning department*)

Historic range of a federal or state listed Rare, Threatened or Endangered species, *California Department of Fish & Game, Wildlife Habitat Data Analysis Branch website http://www.dfg.ca.gov/whdab/index.html and the California Natural Diversity Data Base http://www.dFg.ca.gov/whdab/html/cnddb.html*

Federal or state listed protected or sensitive plant species, *California Native Plant Society website http://www.cnps.org, and the California Natural Diversity Data Base http://www.dFg.ca.gov/whdab/html/cnddb.html*

Locally protected tree as a result of an adopted city/county tree protection or preservation ordinance, c*ontact the city/county planning department, city department of parks and recreation.*

Community Relations

U.S. Census Bureau census block information, *California Department of Finance, Demographic Research Unit website http://www.dof.ca.gov/HTML/DEMOGRAP/Druhpar.asp*

Community Resources

Local government enterprise zone or similar area, contact the local city/county planning department and the local economic development agency *website http://www.ecodevdirectory.com/california.htm.*

Labor force, *California Employment Development Department Labor Market Information Division website http://www.labormarketinfo.edd.ca.gov/ and* www.calmis.ca.gov/file/resource/LMIConsultants.pdf

Cultural Resources

Federal or state register of historic places (both registers include districts, sites, buildings, structures, and objects that are significant in American or California history, architecture, archeology, engineering, and culture). *U.S. Department of the Interior, National Park Service, National Register of Historic Places website http://www.nationalregisterofhistoricplaces.com/welcome.htm*

California Office of Historical Preservation - California Historical Resources Information System (CHRIS) website http://ohp.parks.ca.gov/default.asp?page_id=1068. Review city/county registers. Contact local historical organizations.)

California Historical Records Systems, *California Office of Historic Preservation, CHRIS website http://ohp.parks.ca.gov/default.asp?page_id=1068*

Native American sacred sites, *California Native American Heritage Commission, http://ceres.ca.gov/nahc/.)*

Fire Hazard Area

High fire hazard area, California Department of Forestry and Fire Protection, or the city/county fire protection department--*California Department of Forestry and Fire Protection, Fire Resources Assessment Program website* http://frap.cdf.ca.gov/data/frapgismaps/select.asp

Flooding

Flood Hazard Zone (for example, A, A1-30, D, et cetera), Federal Emergency Management Agency (FEMA), *http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1. Also,contact the city/county planning department or regional flood control agency.*)

Hazardous Materials On-Site

Federal or state Environmental Protection Agency, hazardous substances, or spills, *California Environmental Protection Agency, Department of Toxic Substances Control - Site Cleanup, http://www.dtsc.ca.gov/SiteCleanup/index.cfm. Also contact city/county environmental health department.*

Underground storage tank(s), *California Environmental Protection Agency, State Water Control Board Water Quality - Underground Storage Tank Program, http://www.swrcb.ca.gov/tankpage.html.* Also c*ontact city/county environmental health department.*

55._____Does the existing natural gas system in the vicinity of the site provide adequate volume to serve a power plant on the site?

Seismic Safety

Regulatory Hazard Zone, *California Geological Survey, http://www.consrv.ca.gov/CGS/geologic_hazards/regulatory_hazard_zones/index.htm*. Also c*ontact the city/county building or planning department.*

Known seismic hazard zone, *California Geological Survey, http://www.consrv.ca.gov/cgs/index.htm*

Soil and Erosion

Soils, *U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app. Also contact city/county building department.*

Known landslide areas and/or erosion-prone areas, *California Department of Conservation, California Geological Survey, http://www.consrv.ca.gov/CGS/geologic_hazards/landslides/index.htm*

Traffic

High priority federal highway corridor or an adopted regional transportation plan special corridor determined to be of statewide or regional priority for long-term right-of-way preservation, *U.S. Department of Transportation Federal Highway Administration, http://www.fhwa.dot.gov/hep10/nhs/hipricorridors/hpcorgk.html. Also, California Department of Transportation (Caltrans), http://www.dot.ca.gov/localoffice.htm. Contact the Caltrans district office and city/county public works/transportation department).*

Visual Resources

Visual impacts to the landscape, *U.S. Department of the Interior, Bureau of Land Management - Visual Resources Management website http://www.blm.gov/nstc/VRM/destech.html*

Appendix D: Biological Resource Survey and Assessment Guidance

Energy Commission

- *Recommended Biological Resources Field Survey Guidelines for Large Solar Projects*

Fish and Wildlife Service

- *Preparing for Any Action That May Occur Within the Range of the Mohave Desert Tortoise (Gopherus agassizii)*
- *Table 3. USFWS Desert Tortoise Pre-Project Survey Guidance*
- *Protecting Burrowing Owls at Construction Sites in Nevada's Mohave Desert Region*
- *Template and Guidance on Preparing an Initiation Package for Endangered Species Act Consultation*
- *Common Flaws in Developing an Effect Determination*

Bureau of Land Management

- *Native Plant Materials Manual*
- *Survey Protocols Required for NEPA and ESA Compliance for BLM Special Status Plant Species*

DRAFT 04/2/2009

CALIFORNIA ENERGY COMMISSION - Recommended Biological Resources Field Survey Guidelines for Large Solar Projects

Based on the following guidelines, provide your proposed biological resource survey parameters to the Energy Commission for review and comment prior to beginning field work.

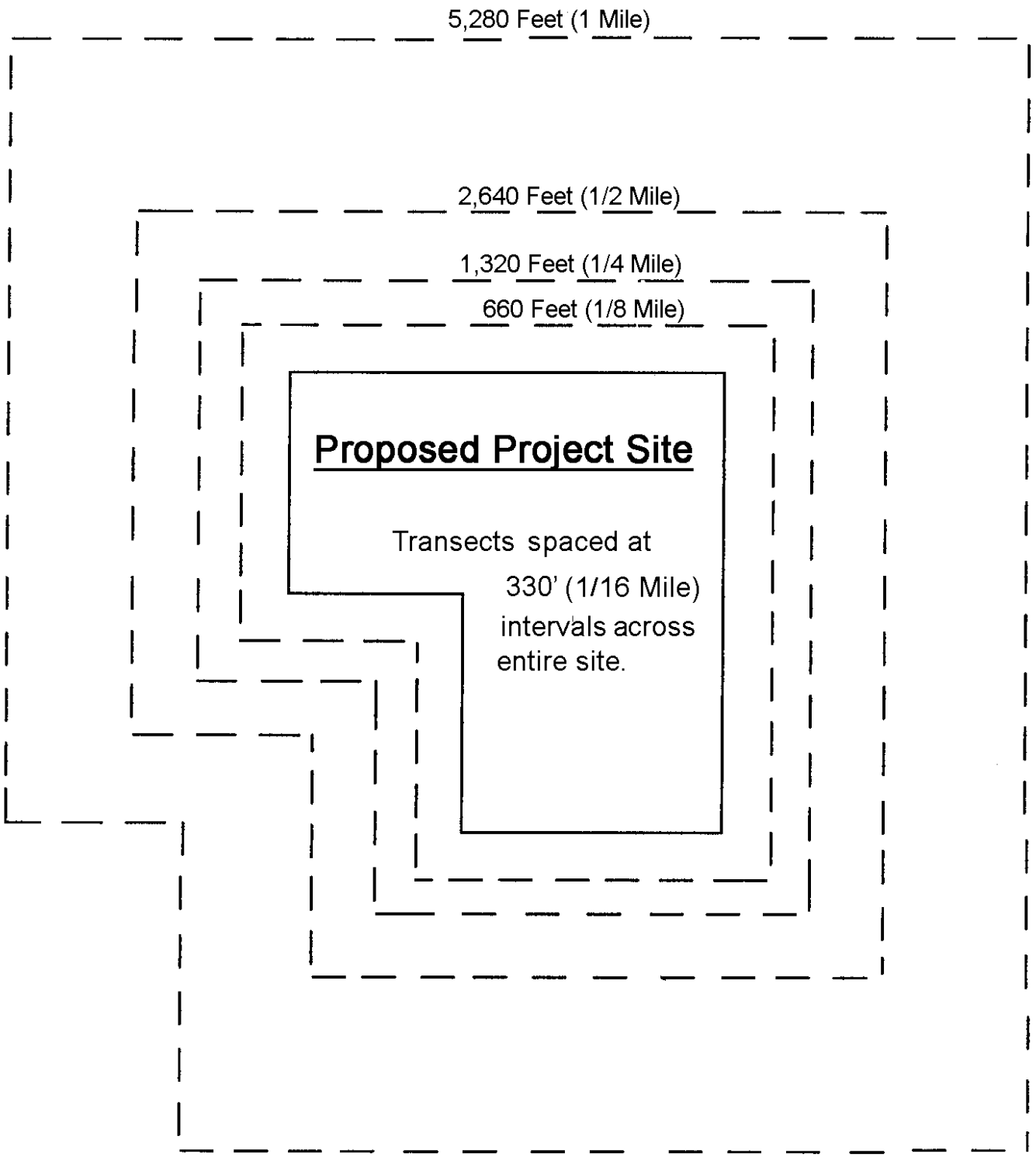
PROJECT FEATURES AND BUFFER	*If Sensitive Species Survey Protocols Exist (e. g. desert tortoise & Mojave ground squirrel)*	*Recommended Wildlife Surveys If Sensitive Species Survey Protocols DON'T Exist*	*Sensitive Plant Surveys*
Project Site	Follow U.S. Fish and Wildlife Service (USFWS) / California Department of Fish and Game (CDFG) survey protocols regarding transect/trap-line spacing Include incidental observations of other species when compiling and mapping[3] survey results	Transects spaced at 330' intervals (every 1/16th of a mile) across entire site Example: A 1-square-mile project site would require 17 wildlife transects for 100% edge to edge coverage	Follow Botanical Survey Guidelines available from the California Native Plant Society (CNPS)[1] and CDFG[2] [It is insufficient to simply cite these protocols in the AFC; please provide details such as survey method(s) and date(s), surveyor name(s), and qualifications. Botanical survey methods vary depending upon species, time of year when species is most identifiable, identification ease/difficulty, site visibility, and vegetation type(s). Reference sites should be visited in advance to familiarize surveyors with target species and check phenology.]
Buffer area 'within 1 mile of the project site' [Per Siting Regulations Section (13) (B) - April 2007, p. 98 - Include a list of the species actually observed and those with a potential to occur within 1 mile of the project site and 1,000 feet from the outer edge of linear facility corridors.]	● Follow survey protocols out to required distance (out to 2400' for desert tortoise and possibly 4800', if USFWS required) ● For area beyond 2400' and out to 1 mile, complete one additional transect at 3960' (3/4 mile) and another at 5280' (1 mile) ● For all transects, document incidental observations of other species and include them when compiling and mapping[3] survey results	4 transects covering area out to 1 mile from the project site – Transects located at 660' (1/8th mile), 1320' (1/4 mile), 2640' (1/2 mile), and 5280' (1 mile) (See attached diagram) Map[3] survey results	Map vegetation and focus buffer area field surveys on areas likely to contain sensitive plants. Conduct 'ground truthing' to verify mapped vegetation. Map survey results in accordance with CNPS or CDFG guidelines referred to above
Linear Facilities [Per Siting Regulations Section (13) (B) - April 2007, p. 98 - Include a list of the species actually observed and those with a potential to occur within 1 mile of the project site and 1,000 feet from the outer edge of linear facility corridors.]	● Follow survey protocols – completed surveys within corridor and out to prescribed distance from the outer edges of the corridor ● Energy Commission Siting Regulations require field survey information for area out to 1000 feet from the outer edges of a linear facility corridor. USFWS survey spacing protocols will be adequate within the 1000' survey area. ● For all transects, document incidental observations of other species and include them when compiling and mapping[3] survey results	● Including a center line transect, additional transect spacing within a 75-100' corridor can be approximately every 30 feet on either side of the center line out to the corridor edge, however this can vary depending upon the corridor vegetation characteristics ● From outermost edges of anticipated work corridor, complete 4 transects (0, 330', 660', and 1000') (See attached diagram) ● Map[3] survey results	Follow Botanical Survey Guidelines available from CNPS[1] and CDFG[2].
Linear Facilities past first point of interconnect	Plot California Natural Diversity Data Base (CNDDB) data (no more than 6 months old) on base map	Plot CNDDB data on base maps (no more than 6 months old)	Map vegetation and discuss CNDDB sensitive plant data (no more than 6 months old) for known sensitive plant occurrences and also those sensitive plants species that are likely to occur within or near linear facility corridor

[1] CNPS Botanical Survey Guidelines can be found at http://www.cnps.org/cnps/rareplants/inventory/guidelines.php
[2] CDFG Plant Survey Guidelines can be found at http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/guideplt.pdf
[3] Map scale and format shall be in accordance with Siting Regulations Section (13) (B) (i)- April 2007, p. 98, or another scale and format deemed suitable by CEC technical staff on a case by case basis

CALIFORNIA ENERGY COMMISSION

Recommended Transect Spacing for Biological Resources Field Surveys

(Draft 05/23/2007)



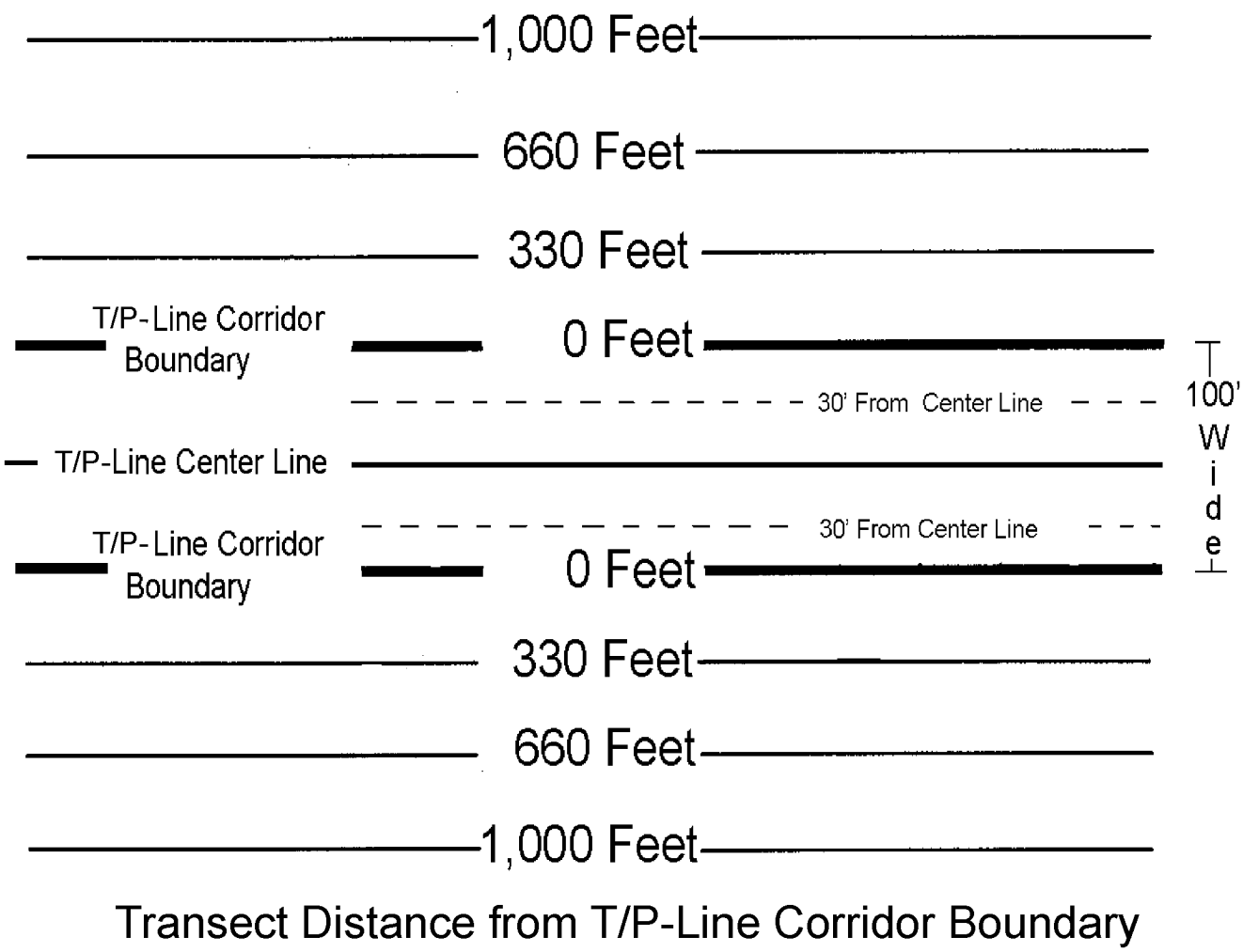
Adapted from USFWS (January 1992)

Attachment 1

CALIFORNIA ENERGY COMMISSION

Recommended Transect Spacing for Biological Resources Field Surveys - Linear Facilities

(Draft 05/23/2007)



Attachment 2

PREPARING FOR ANY ACTION THAT MAY OCCUR WITHIN THE RANGE OF THE MOJAVE DESERT TORTOISE (*Gopherus agassizii*)

The Mojave population of the desert tortoise (*Gopherus agassizii*) was listed by the U.S. Fish and Wildlife Service (USFWS) as threatened on April 2, 1990 (USFWS 1990) and by the State of California on August 3, 1989. Subsequently, proposed actions within the range of the desert tortoise fall under purview of the Endangered Species Act 1973, as amended (ESA), in addition to State regulations, including the California Endangered Species Act (CESA). For detailed information on the ecology of the Mojave desert tortoise, please see USFWS (2009).

This protocol provides recommendations for survey methodology to determine presence/absence and abundance of desert tortoises for projects occurring within the species range on Federal and non-Federal lands, and to provide a standard method for reporting survey results. Information gathered from these procedures will: 1) help determine the appropriate level of consultation with USFWS and the appropriate state agency; 2) help determine the incidental take of desert tortoises resulting from proposed projects as defined by the ESA and CESA; and 3) help minimize and avoid take.

This guidance includes:

- Site Assessment
- Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats
- USFWS 2009 Desert Tortoise Pre-project Survey Data Sheet

This guidance is subject to revision as new information becomes available. Before initiating the protocols described below, please check with your local USFWS and appropriate state agency offices to verify that you are implementing the most up-to-date methods. To ensure quality and reduce the likelihood of nonconcurrence with survey results, we recommend that the names and qualifications of the surveyors be provided to USFWS and appropriate state agency for review prior to initiating surveys.

In Arizona:

U.S. Fish and Wildlife Service
Arizona Ecological Services
323 N. Leroux St., Suite 201
Flagstaff, AZ 86001
(928) 226-0614

In California, for Inyo, Kern, Los Angeles, and San Bernardino Counties:

U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003
(805) 644-1766

In California, for Imperial and Riverside Counties, and Joshua Tree National Park and the San Bernardino National Forest in San Bernardino Co:

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009
(760) 431-9440

In Nevada:

U.S. Fish and Wildlife Service
Southern Nevada Field Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
(702) 515-5230

In Utah:

U.S. Fish and Wildlife Service
Utah Ecological Services Field Office
2369 West Orton Circle
West Valley City, Utah 84119
(801) 975-3330

State Agencies

Arizona Game & Fish Department
State Headquarters--Nongame Branch
5000 W. Carefree Highway
Phoenix, AZ 85086
623-236-7767

California Department of Fish and Game (CDFG)
For Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, San Benito, San Luis Obispo, Stanislaus, Tulare and Tuolumne Counties:
Central Region Headquarters Office
1234 E. Shaw Avenue
Fresno, CA 93710
(559) 243-4005 ext. 151

For Imperial, Inyo, Mono, Riverside and San Bernardino Counties:
Inland Deserts Regional Office
3602 Inland Empire Boulevard, Suite C-220
Ontario, CA 91764
(909) 484-0167

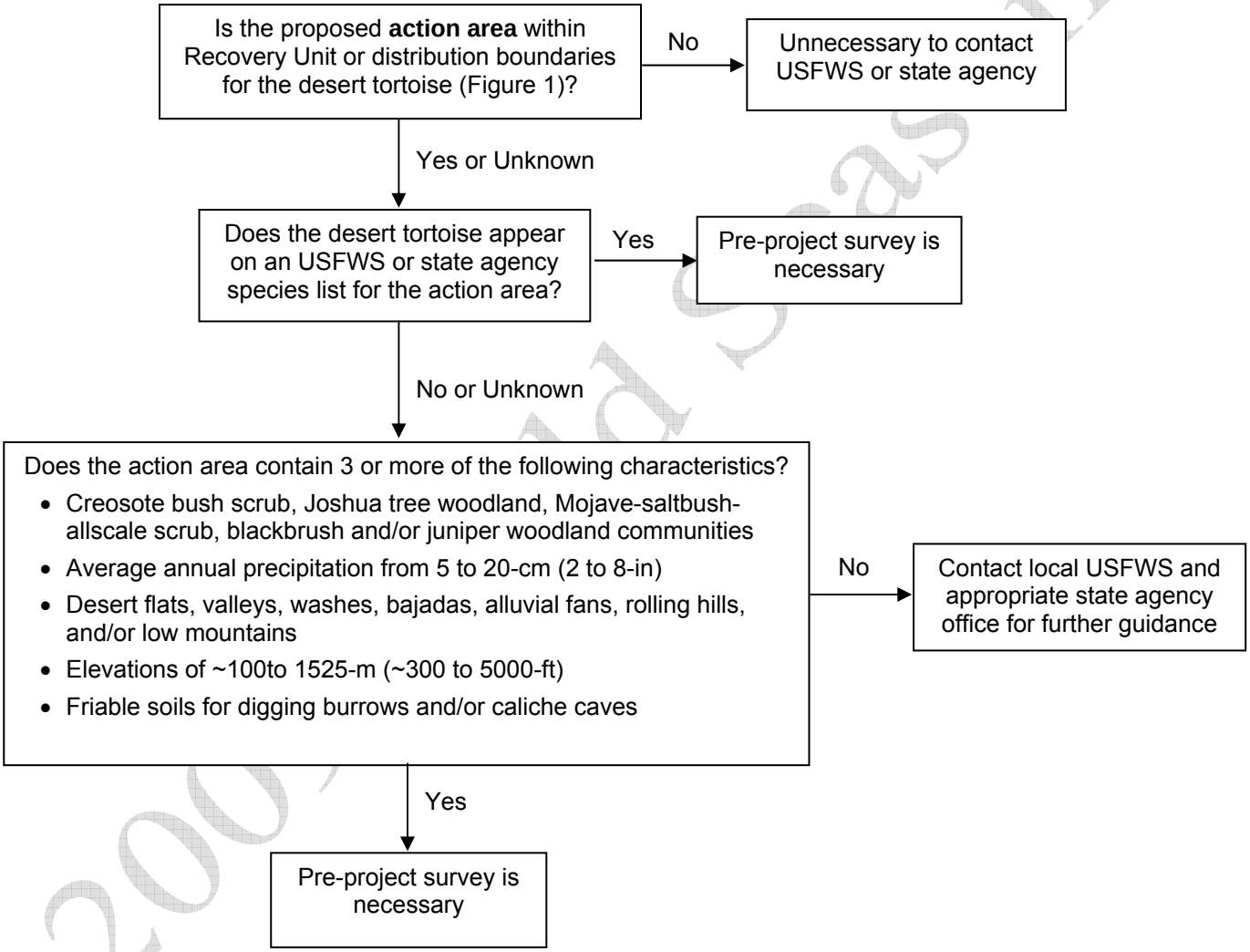
For Los Angeles, Orange, San Diego, Santa Barbara and Ventura Counties:
South Coast Regional Office
4949 Viewridge Avenue
San Diego, CA 92123
(858) 467-4201

Nevada: Department of Wildlife:
Southern Region
4747 Vegas Dr.
Las Vegas, NV 89108
(702) 486-5127

Utah Division of Wildlife Resources:
Southern Region
1470 N Airport Rd
Cedar City, UT 84720
(435) 865-6100

Site Assessment

Use the below key to assess if desert tortoises may be present within or near the action area and determine survey and consultation requirements[1]. The **action area** is defined by regulation as all areas to be affected directly or indirectly and not merely the immediate area involved in the action (50 CFR §402.02). The extent of the action area is not limited to the "footprint" of the action nor is it limited by the authority of the Federal, state, or local agency or any other entity proposing the project. The environmental baseline, the analysis of the effects of the action, and the amount or extent of incidental take are based upon the action area. If you cannot access the entire action area during your surveys for some reason (e.g. access to private property is unavailable), please note that in your survey report.



[1] If determined that the proposed project is not likely to adversely affect the desert tortoise and a tortoise or tortoise sign (shells, bones, scutes, limbs, burrows, pallets, scats, egg shell fragments, tracks, courtship rings, drinking sites, mineral licks, etc.) is found in the action area during implementation of the proposed project, the proposed action should *immediately* stop and then it must be determined whether further or formal consultation is necessary to comply with the ESA or CESA in California. It is recommended that the USFWS and CDFG in California be notified in writing within three days of the discovery. This short notification period will help ensure a prompt response by USFWS and CDFG to facilitate ESA and CESA compliance.

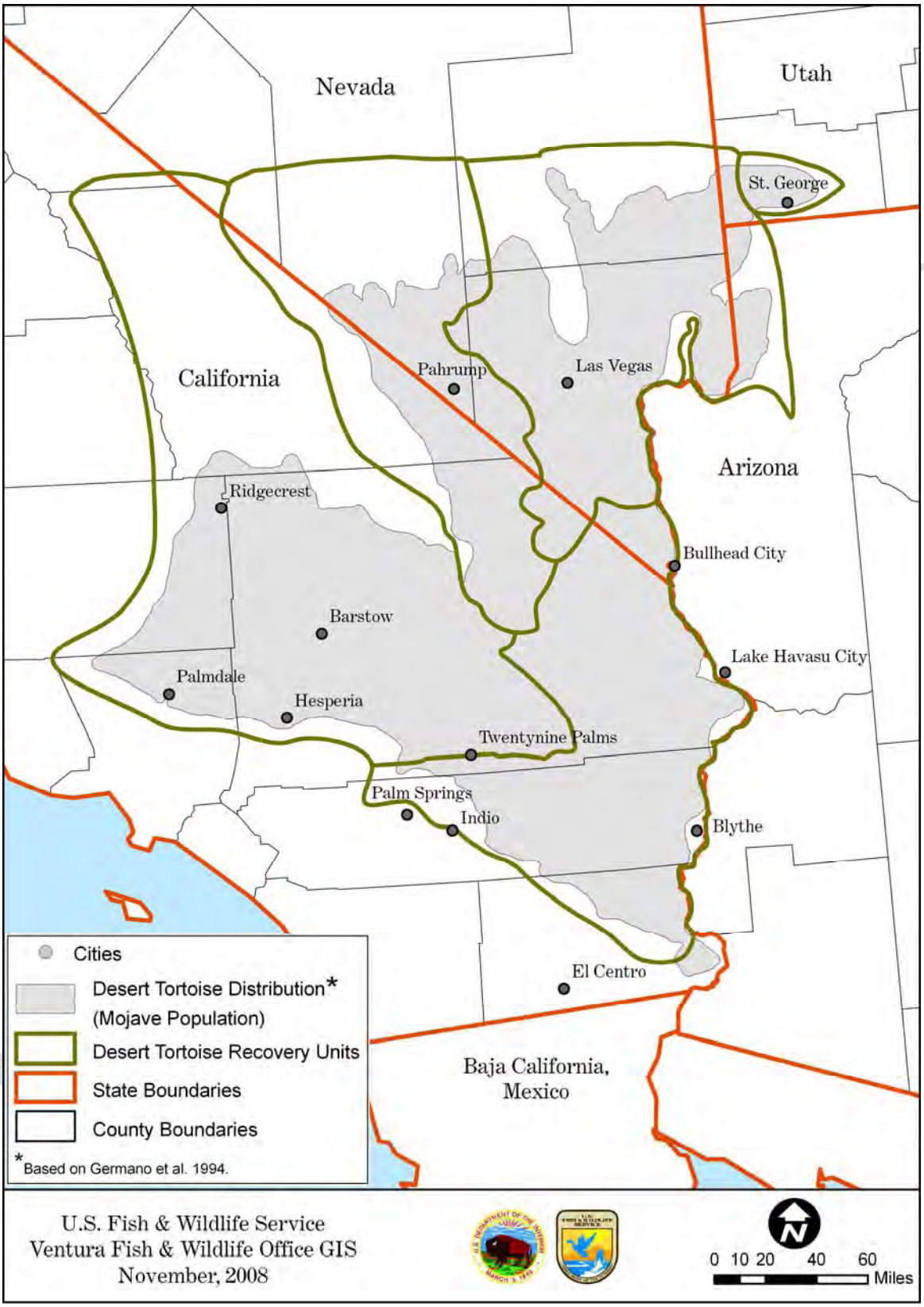


Figure 1: Known Range of the Desert Tortoise (Mojave Population)

Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats

Objectives of survey

- Determine presence or absence of desert tortoises within the action area
- Estimate the number of tortoises (abundance) within the action area
- Assess the distribution of tortoises within the action area to inform take avoidance and minimization

The **action area** is defined by regulation as all areas to be affected directly or indirectly and not merely the immediate area involved in the action (50 CFR §402.02). The action area is not limited to the "footprint" of the action or jurisdiction. Rather, it is a biological determination of the reach of the proposed action on listed species.

Field Methods

This protocol takes into account the fact that not all tortoises within the action area are seen by the surveyor. Provided is an equation which accounts for tortoises that are below ground at the time of surveys and for above-ground tortoises that are cryptic and may be missed.

$$\begin{pmatrix}\text{Estimated number of tortoises}\\ \text{within action area}\end{pmatrix} = \frac{\begin{pmatrix}\text{Number of tortoises}\\ \text{observed above ground}\end{pmatrix}}{\begin{pmatrix}\text{Probability that}\\ \text{a tortoise is}\\ \text{above ground } (P_a)\end{pmatrix}\begin{pmatrix}\text{Probability of}\\ \text{detecting a tortoise,}\\ \text{if above ground } (P_d)\end{pmatrix}}\left(\frac{\text{Action area}}{\text{Area surveyed}}\right)$$

Surveys of 100% coverage, or probabilistic sampling where appropriate, should utilize this equation to estimate the number of tortoises within the action area (see below; Table 1, P_a and P_d).

- Information to determine presence/absence *and* estimate number of tortoises within the action area is collected during the same survey effort. Surveyed objects include all tortoises that are above ground (both out of burrows and within burrows but still visible), as well as all tortoise sign (burrows, scats, carcasses, etc). Record all locations of tortoises and sign encountered during the survey effort using the USFWS 2009 Desert Tortoise Pre-Project Survey Data Sheet (attached). Please submit a copy of the original datasheets with results of the survey to your local USFWS office.
- Surveys should be conducted during the tortoise's most active periods (April through May or September through October) (Nussear and Tracy 2007; Inman 2008; USFWS 2009). Surveys outside these time periods may be approved by USFWS, and CDFG in California (e.g., warm weather in March or rainfall in August stimulating increased tortoise activity).
- Desert tortoises utilize burrows to avoid daily and annual thermal extremes (Woodbury and Hardy 1948). Therefore, surveys should take place when air temperatures are below 40°C (104°F) (Zimmerman et al. 1994; Walde et al. 2003; Inman 2008). Air temperature is measured ~5-cm from the soil surface in an area of full sun, but in the shade of the observer.
- Ten-meter (~30-ft) wide belt transects should be used during surveys. For all projects, surveys which cover the entire project area with the 10-m belt transects (100% coverage) are always an acceptable option. For very large action areas, probabilistic sampling may also be an option, such that the appropriate proportion of the action area is surveyed (Table 2). If probabilistic sampling is an option for the project site, each transect should be chosen either systematically or randomly ensuring that the entire action area has an equal probability of being included in the sample. Transects should be completed in a random order, oriented in a logistically convenient pattern (e.g., lines, squares, or triangles). Any sampling design other than simple systematic or random sampling must be approved by USFWS (e.g. stratification). See *Frequently Asked Questions* section for a discussion of 100% coverage and probabilistic sampling.
- USFWS considers the results of a pre-project survey to be valid for no more than one year. If survey results are older than one year, please contact the local USFWS office.

Presence or absence of desert tortoises within the project vicinity

- Occurrence of either live tortoises or tortoise sign (burrows, scats, and carcasses) in the action area indicates desert tortoise presence and therefore requires formal consultation with USFWS.
- If neither tortoises nor sign are encountered during the action area surveys and the project, or any portion of project, is ≤ 0.8 km^2 (200 acres) or linear, three additional 10-m (~30-ft) belt transects at 200-m (~655-ft) intervals parallel to and/or encircling the project area perimeter (200-m, 400-m, and 600-m from the perimeter of the project site) should be surveyed. These transects are employed only as part of the presence/absence determination; they are not included in the estimation of tortoise abundance. See *Frequently Asked Questions* section below for an explanation of why additional surveys are needed.
- If neither tortoises nor sign are encountered during the action area surveys, as well as project perimeter surveys where appropriate, please contact your local USFWS office. Informal consultation with the USFWS may be required even though no desert tortoises or sign are found during surveys.

Number of tortoises within the action area

The attached Table 3 spreadsheet will estimate the number of adult tortoises (>160 mm MCL) within the action area using the "Number of tortoises within the action area" equation from above.

Enter the requested information into the Table 3 spreadsheet, as follows:

1. Enter the total project area.
2. Enter the appropriate value from Table 1 for the term "probability that a tortoise is above ground" (P_a).
3. Enter the number of adult tortoises (>160-mm midline carapace length) found during the survey of the action area for the term "number of tortoises observed above ground" (n).

Table 1. Probability that a desert tortoise is above ground (P_a) relative to the previous winter's rainfall (October through March)

Use amount of rainfall from the winter preceding the pre-project survey to determine which value of P_a *is appropriate for the project*

To find this amount of rainfall, go to the Western Regional Climate Center site: http://www.wrcc.dri.edu/summary/Climsmsca.html; click on your location and scroll down to "monthly totals"

Previous Winter Rain	Probability (P_a)	Variance(P_a)
<40 mm (~1.5 inches)	0.64	0.08
≥40 mm (~1.5 inches)	0.80	0.05

The estimate for the term "probability of detecting a tortoise if above ground (P_d)" is already included in spreadsheet Table 3 (P_d = 0.63; variance = 0.011). See *Frequently Asked Questions* section below for how P_a and P_d and their associated variances were estimated.

See *Appendix 1* for a detailed description of the method used to estimate desert tortoise abundance.

100% Coverage or Probabilistic Sampling?

100% coverage surveys are always an acceptable option, regardless of the size of the action area. For very large action areas, probabilistic sampling may be an additional option, such that the appropriate proportion of the action area is surveyed as detailed below.

For the 2009 field season, probabilistic sampling is not an option for desert tortoise pre-project surveys in California due to the requirement of CESA to avoid, minimize, and fully mitigate (CDFG code section 2081).

Table 2. Is probabilistic sampling an appropriate option for the proposed action area?

Is your action area smaller than the area given below for the recovery unit in which the project occurs?

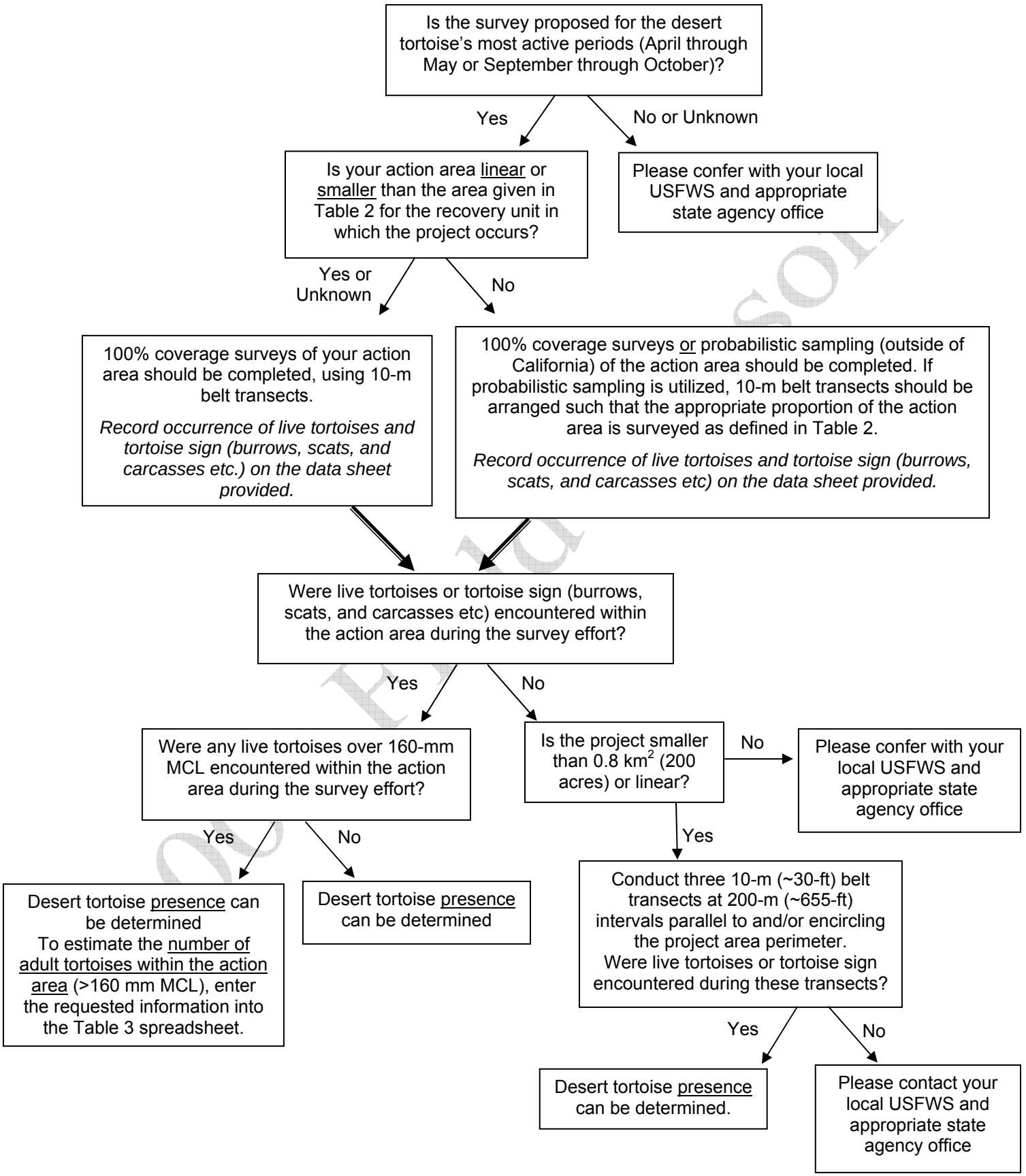
Recovery Unit	Threshold Action Area to Allow Sampling
Western Mojave	7.2 km^2 (1777 acres)
Eastern Mojave	10.8 km^2 (2676 acres)
Colorado Desert	6.4 km^2 (1573 acres)
Northeastern Mojave	23.3 km^2 (5764 acres)
Upper Virgin River	2.0 km^2 (490 acres)

If yes: 100% coverage surveys of your action area must be completed.

If no, total transect lengths that must be surveyed are given below. 100% coverage surveys are also an option, regardless of the size of the project.

Recovery Unit	Total Transect Length (km) to Sample
Western Mojave	719
Eastern Mojave	1083
Colorado Desert	637
Northeastern Mojave	2333
Upper Virgin River	198

Decision Tree for Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats



Frequently Asked Questions: Desert Tortoise Pre-project Field Survey Protocol

Why did USFWS revise the 1992 USFWS Desert Tortoise Pre-project Survey Protocol?

Desert tortoises occur at low densities across most of the Mojave Desert (USFWS 2006). They are cryptic and spend much of their time underground in burrows (Burge 1977; Nagy and Medica 1986; Bulova 1994) and therefore not all animals within an area will be seen by even the best trained surveyors. Tortoises underground in burrows, as well as individuals hidden above ground, need to be included in estimates.

The 1992 USFWS Desert Tortoise Pre-project Survey protocol was based on a Bureau of Land Management protocol from the mid-1970s, which utilized the best available information at the time, but did not take into account that some tortoises will be underground and missed during the survey effort. The data collected during the extensive USFWS range-wide monitoring program (currently <7,000-km of transects each year; USFWS 2006) have allowed us to improve pre-project survey methods. Data about the proportion of tortoises underground in burrows, as well as the probability that an above-ground tortoise will be observed by the surveyor are included in the estimate of the number of tortoises within the action area (P_a and P_d).

This protocol also addresses the potential for using probabilistic sampling when the action area is above the size limits given in Table 2. 100% coverage surveys are *always* an acceptable option, regardless of the size of the action area. For very large action areas, sampling may be an additional option, such that the abundance estimates can be calculated when an appropriate proportion of the action area is surveyed. Estimates of tortoise densities within recovery units from the range-wide monitoring program have been used to calculate how many km^2 of a project site must be surveyed to produce a statistically robust abundance estimate (Table 2).

What happened to the zone of influence transects recommended in the 1992 protocol?

This revised protocol requires that the entire action area, rather than just the project footprint, be included in the survey effort. The **action area** is defined by regulation as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action” (50 CFR §402.02). The action area is therefore not limited to the "footprint" of the project nor is it limited by the Federal agency's authority. Rather, the action area is a biological determination of the reach of the proposed action on listed species, which must, by definition, encompass the zone of influence of the project.

How did USFWS determine the values for the “probability that a tortoise is above ground”?

The USFWS range-wide monitoring program estimated the proportion of the desert tortoise population that is visible using telemetered animals from focal areas in spring 2001-2005 (USFWS 2006). This probability is related to the previous winter’s rainfall, as illustrated in Table 1. The range of fall above-ground activity is similar to spring numbers, but the variability is much higher (Nussear and Tracy 2007; Inman 2008). Until more robust estimates of fall above-ground activity are available, spring estimates based on the previous winter’s rainfall (October through March) are used for surveys conducted in either active period.

How did USFWS establish the value for the “probability of detecting a tortoise, if above ground”?

For the past five years, surveyors in the USFWS range-wide monitoring program have undergone training on established transects with artificial tortoises. Trained surveyors detected an average of ~63% of model tortoises that were within 5-m of either side of the transect center-line (USFWS unpublished).

Why are only tortoises over 160-mm MCL used to estimate the number of tortoises within the action area?

The values of P_a and P_d used in the equation to estimate the number of tortoises within the action area are based on USFWS range-wide monitoring data collected for adult tortoises ≥160-mm MCL.

What is the purpose of 100% coverage surveys versus probabilistic sampling?

The purpose of surveying is to determine presence/absence and estimate the abundance of desert tortoises within the action area. For 100% coverage surveys, transects are placed across the entire action area; thus, the entire area for which abundance is estimated is surveyed. A probabilistic sampling approach, on the other hand, uses data from randomly or systematically placed transects to draw inferences about locations where surveys are not conducted. All locations for which abundance will be estimated *must* have an equal probability of being included in the sample.

How were the threshold project sizes calculated for determining whether 100% coverage or probabilistic sampling is appropriate?

The validity of probabilistic sampling requires that all locations for which abundance will be estimated have an equal probability of being included in the sample, as well as the expected sample size. Estimating the number of tortoises within the project area using probabilistic sampling is limited by the number of tortoises encountered during the survey effort. Therefore, whether or not the project area must be surveyed using 100% coverage or can be probabilistically sampled is based on the area expected to yield a survey count of 20 tortoises (Krzysik 2002). Table 2 uses tortoise densities and detection probabilities estimated from 2001-2005 range-wide line-distance sampling efforts for each tortoise Recovery Unit (USFWS 2006) to calculate that area of a project site that must be surveyed to produce a statistically robust estimate. If the project area is large enough to allow the option of probabilistic sampling, Table 2 provides the minimum transect kilometers (10-m wide) that must be surveyed.

What if the minimum length of 10-m wide transect kilometers are completed but 20 tortoises were not found in the action area?

If probabilistic sampling is used and < 20 tortoises are found after surveying the total transect length prescribed by Table 2, number of tortoises within the action area may be estimated using number found.

Do I keep surveying if 20 tortoises are found before the minimum transect kilometers that must be surveyed are completed?

If probabilistic sampling was used and the transects have been completed in a random order, project area surveys may be considered complete when 20 tortoises have been found or the specified number of kilometers have been sampled, whichever happens first. It is okay if more that 20 tortoises are found, this will decrease the width of the 95% confidence interval for the abundance estimate.

Why do small and linear projects where no tortoises were found have to do additional surveys at 200-m (~655-ft) intervals parallel to the project area perimeter?

Even though neither tortoises nor tortoise sign were found within the action area at the time of the survey, the area may be part of an animal's home range. The home range of a female desert tortoise averages around 0.15 to 0.16 km^2 (35 to 40 acres), about one third the size of male home ranges, which are variable and can be > 2 km^2 (O'Conner et al. 1994; Duda et al. 1999; Harless et al. In press). Therefore, projects that are ≤ 0.8 km^2 (200 acres) or linear may overlap only part of a tortoise's home range and the possibility that a resident tortoise was outside the project area at the time surveys were conducted must be addressed. In these cases, USFWS recommends three additional 10-m (~30-ft) belt transects at 200-m (~655-ft) intervals parallel to and/or encircling the project area perimeter (200-m, 400-m, and 600-m from the perimeter of the project site). Record any tortoises or sign encountered during these surveys. These transects are employed only as part of the presence/absence determination; they are not included in the estimation of tortoise abundance within the project area.

What does the 95% confidence interval for the number of tortoises within the action area mean?

Confidence intervals are used to indicate the reliability of an estimate. The interval gives an estimated range of values, calculated from a set of sample data, which is likely to include an unknown population parameter (in this case, the true number of tortoises within the action area). A wider confidence interval indicates that less certainty is associated with the estimate (see Appendix 2). The Table 3 spreadsheet calculates the abundance and associated 95% confidence interval for the estimated number of tortoises within the project area (Buckland et al. 2001).

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Appendix 1. Detailed description of desert tortoise abundance and CI estimation

The estimated abundance of adult desert tortoises within the action area is given by:

$$\begin{pmatrix}\text{Estimated number of tortoises}\\ \text{within action area}\end{pmatrix} = \frac{\begin{pmatrix}\text{Number of tortoises}\\ \text{observed above ground}\end{pmatrix}}{\begin{pmatrix}\text{Probability that}\\ \text{a tortoise is}\\ \text{above ground}\end{pmatrix}\begin{pmatrix}\text{Probability of}\\ \text{detecting a tortoise,}\\ \text{if above ground}\end{pmatrix}}\left(\frac{\text{Action area}}{\text{Area surveyed}}\right),$$

which is equivalent to:

$$\hat{N} = \left[\frac{(n)}{(Table2)(0.63)}\right]\left[\frac{(A)}{(a)}\right],$$

where $\hat{N}$ = estimated abundance within entire action area, *n* = number of tortoises observed above ground, *A* = total action area, and *a* = actual area surveyed (= total # km surveyed * 0.01). For 100% coverage surveys, *A/a* = 1.

Table 3 uses the following equations to calculate the 95% confidence interval for the estimate of tortoise abundance within the action area (Buckland et al. 2001), assuming all replicate transect lines are the same length, 10-km.

$$\hat{\text{var}}(n) = L\sum_{i=1}^{k} l_i\left(\frac{n_i}{l_i} - \frac{n}{L}\right)^2 /(k-1)$$

where $\hat{\text{var}}(n)$ = the spatial variation in the number of tortoises detected through the total transect length L, n_i = the number of tortoises seen on transect *i*, l_i = the length of individual transect *i*, and *k* = total number of transects walked.

Putting the sources of variability together, the variance of density is:

$$\text{var}\,\hat{D} = \hat{D}^2\left[\frac{\text{var}(n)}{n^2} + \frac{\text{var}(\hat{P}_a)}{(\hat{P}_a)^2} + \frac{\text{var}(\hat{P}_d)}{(\hat{P}_d)^2}\right]$$

Because the tortoise density sampling distribution is positively skewed, the confidence interval is calculated using a log-distribution for density and built with division and multiplication, rather than addition and subtraction from the mean as with a symmetrical interval (Buckland et al. 2001).

Thus, the 95% confidence interval for $\hat{N}$ is:

$$\left(\hat{N}/C_N, \hat{N}\cdot C_N\right),$$

where $C_N = \exp\left[z_\alpha\sqrt{\text{var}(\log_e \hat{D})}\right]$ and $\text{var}(\log_e \hat{D}) = \log_e\left[1 + \frac{\text{var}(\hat{D})}{\hat{D}^2}\right]$.

Given the simplifying assumptions in this protocol, the 95% confidence interval around the estimated number of tortoises within the action area will be wide (e.g., the estimate of the number of tortoises will be imprecise). While this level of imprecision would not be appropriate for recovery planning and decision making at large scales, this protocol provides estimates at local scales that most efficiently utilize the best information that is available to provide statistically defensible results.

Appendix 2. Example

Project location = near Beatty, NV (within the Eastern Mojave RU)

Action area = 12 km^2 (3,000 acres)

According to this protocol's Site Assessment key, the proposed action is within the known range of the desert tortoise. The local USFWS and appropriate state agency offices were contacted and a species list, which includes the desert tortoise, was obtained for the action area. Therefore, pre-project survey and consultation are necessary.

The project footprint is only 10 km^2, but since the project will include blasting, the reach of the proposed action on listed species extends to 12 km^2. Thus, the action area (and therefore the area which needs to be surveyed for desert tortoises) is 12 km^2 (which is more inclusive than the 10 km^2 project footprint).

According to Table 2 of the pre-project survey protocol, the project size of 12 km^2 is above the threshold project area to allow probabilistic sampling in the Western Mojave RU (10.8 km^2 threshold). Therefore, at a minimum, 1,083 km of transects must be walked. For this example, 108 10-km transects (10-m wide) were placed systematically across the project site and were completed in a random order. Surveys of 100% coverage in which 10-m wide transects were placed across the entire 12 km^2 action area would also have been acceptable.

Transects totaling 1,083 km were conducted and 19 adult tortoises (> 160 mm carapace length) were found (as well as tortoise sign, both of which were catalogued using the USFWS 2009 DT pre-project survey protocol data sheet). If 20 adult tortoises had been encountered before the 1,083 km of transects were completed, and transects were conducted in a random order, then surveys could have been considered complete after the 20th tortoise was catalogued.

Data collected from the108 transects (live animals encountered <160-mm MCL)

Number of tortoises (n_i)	Number of transects on which n_i tortoises were seen
0	93
1	11
2	4

Using the Western Regional Climate Center website, it was determined that the Beatty area had received 97-mm (3.8 inches) of rain in the October through March preceding the survey effort, which is above the 40-mm (1.5 inches) in Table 1. Therefore, P_a of 0.80 will be used in this estimation.

Thus, from

$$\hat{N} = \left[\frac{(n)}{(Table2)(0.63)}\right]\left[\frac{(A)}{(a)}\right]$$, we get $$\hat{N} = \left[\frac{(19)}{(0.80)(0.63)}\right]\left[\frac{(12\,\text{km}^2)}{(10.8\,\text{km}^2)}\right]$$, or $\hat{N} =\sim 42$ tortoises

$$\text{Density} = \frac{(\hat{N})}{(A)}$$, we get $$\hat{D} = \frac{(42)}{(12\,\text{km}^2)}$$, or $\hat{D} =\sim 3.5$ tortoises/km^2

To calculate the 95% confidence interval for our abundance estimate, we use:

$$\hat{\text{var}}(n) = L\sum_{i=1}^{k} l_i\left(\frac{n_i}{l_i} - \frac{n}{L}\right)^2 /(k-1),$$

we get $\hat{\text{var}}(19) = 1080\left[(93)(10)\left(\frac{0}{10} - \frac{19}{1080}\right)^2 + (11)(10)\left(\frac{1}{10} - \frac{19}{1080}\right)^2 + (4)(10)\left(\frac{2}{10} - \frac{19}{1080}\right)^2\right]/(108-1)$, or

$\hat{\text{var}}(19) = 23.88$

And for,

$\text{var}\,\hat{D} = \hat{D}^2\left[\frac{\text{var}(n)}{n^2} + \frac{\text{var}(\hat{P}_a)}{(\hat{P}_a)^2} + \frac{\text{var}(\hat{P}_d)}{(\hat{P}_d)^2}\right]$, we get $\text{var}\,\hat{D} = 3.5^2\left[\frac{23.88}{19^2} + \frac{0.05}{0.80^2} + \frac{0.011}{0.63^2}\right]$, or $\text{var}\,\hat{D} = 2.107$

Using our log-transformation because the tortoise density sampling distribution is positively skewed,

$\text{var}(\log_e \hat{D}) = \log_e\left[1 + \frac{\text{var}(\hat{D})}{\hat{D}^2}\right]$, we get $\text{var}(\log_e \hat{D}) = \log_e\left[1 + \frac{2.107}{3.5^2}\right]$, or $\text{var}(\log_e \hat{D}) = 0.15$

Then,

$C_N = \exp\left[z_\alpha\sqrt{\text{var}(\log_e \hat{D})}\right]$, we get $C_N = \exp\left[(1.96)\sqrt{0.15}\right]$, or $C_N = 2.18$

And,

$\left(\hat{N}/C_N, \hat{N}\cdot C_N\right)$, we get $\left((42/2.18), (42\cdot 2.18)\right)$, or ~$(19, 92)$.

Summary

Using the Site Assessment key, it was determined that survey and consultation were necessary for the proposed action. Thus, the pre-project field survey protocol was implemented. In this case, probabilistic sampling with equal length transects (10-km long) was used and 19 adult tortoises and tortoise sign were found during the sampling of the action area, indicating presence. Using the equations and data presented in Appendix 1 of this protocol, Table 3 estimated the actual number of tortoises within the project was estimated to be ~42, with a 95% confidence interval of ~(19, 92).

USFWS 2009 DESERT TORTOISE PRE-PROJECT SURVEY DATA SHEET

Date of survey: _____ Survey biologist(s): _____
(day, month, year)

Site description: _____
(project name and size; general location)

County:_____ Quad:_____ Location:_____
(UTM coordinates, lat-long, and/or TRS; map datum)

Transect #: ____ Transect length: _____ Type of survey: _____
(project area size to be surveyed; 100% coverage/probabilistic sampling)

GPS Start-point: _____ _____ Start time: _____am/pm
(easting, northing, elevation in meters)

GPS End-point: _____ End time: _____am/pm
(easting, northing, elevation in meters)

Start Temp: _____ºC Weather: _____

End Temp: _____ºC

Live Tortoises

Detection number	GPS location Easting	Northing	Time	Tortoise location (*in burrow*: all of tortoise beneath plane of burrow opening, or *not in burrow*)	Approx MCL >160-mm? (*Yes, No or Unknown*)	Existing tag # and color, if present
1						
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	Northing	Type of sign (*burrows, scats, carcass, etc*)	Description and comments
1				
2				
3				
4				
5				
6				
7				
8				

Table 3. USFWS Desert Tortoise Pre-Project Survey Guidance

What is the estimated number of tortoises and associated 95% confidence interval for the action area?

INSTRUCTIONS ***Use this tab when your transects were of unequal length.***

Enter the appropriate values from the survey into the yellow cells below. The number of tortoises and assocated 95% confidence interval for the action area will be calculated.

N =	**42.4**
Lower 95%CI =	**19.41**
Upper 95%CI =	**92.54**
Total action area (acres)	**3000**
Prob that a tort is above ground given winter rainfall (Pa from Table 2) =	**0.800**
Total length of transects walked (km) =	**1080**
Number of transects walked =	**108**
Number of tortoises found during surveys (n) =	**19**

Transects of various lengths

Transect	Length (km)	Tortoises within 5m of centerline
1	10.0	0
2	10.0	0
3	10.0	0
4	10.0	0
5	10.0	2
6	10.0	0
7	10.0	0
8	10.0	0
9	10.0	0
10	10.0	2
11	10.0	0
12	10.0	0
13	10.0	2
14	10.0	1
15	10.0	1
16	10.0	1
17	10.0	1
18	10.0	0
19	10.0	0
20	10.0	0
21	10.0	2
22	10.0	0
23	10.0	0
24	10.0	0
25	10.0	0
26	10.0	0

27	10.0	0
28	10.0	0
29	10.0	0
30	10.0	0
31	10.0	0
32	10.0	0
33	10.0	0
34	10.0	0
35	10.0	0
36	10.0	1
37	10.0	0
38	10.0	0
39	10.0	0
40	10.0	1
41	10.0	0
42	10.0	0
43	10.0	0
44	10.0	0
45	10.0	0
46	10.0	0
47	10.0	1
48	10.0	0
49	10.0	1
50	10.0	0
51	10.0	0
52	10.0	0
53	10.0	0
54	10.0	0
55	10.0	0
56	10.0	0
57	10.0	0
58	10.0	0
59	10.0	0
60	10.0	0
61	10.0	0
62	10.0	0
63	10.0	0
64	10.0	0
65	10.0	0
66	10.0	0
67	10.0	0
68	10.0	0
69	10.0	0
70	10.0	0
71	10.0	0
72	10.0	0
73	10.0	0
74	10.0	0
75	10.0	0
76	10.0	0
77	10.0	0
78	10.0	0
79	10.0	0

80	10.0	0
81	10.0	0
82	10.0	0
83	10.0	1
84	10.0	0
85	10.0	0
86	10.0	0
87	10.0	1
88	10.0	0
89	10.0	0
90	10.0	0
91	10.0	0
92	10.0	0
93	10.0	0
94	10.0	0
95	10.0	0
96	10.0	0
97	10.0	0
98	10.0	0
99	10.0	0
100	10.0	0
101	10.0	1
102	10.0	0
103	10.0	0
104	10.0	0
105	10.0	0
106	10.0	0
107	10.0	0
108	10.0	0
109	5.0	0
110	5.0	0
111	5.0	0
112	5.0	0
113	5.0	0
114	5.0	0
115	5.0	0
116	5.0	0
117	5.0	0
118	5.0	0
119	5.0	0
120	5.0	0
121	5.0	0
122	5.0	0
123	5.0	1
124	5.0	0
125	5.0	0
126	5.0	0
127	5.0	0
128	5.0	0
129	3.0	0
130	3.0	0
131	3.0	0
132	3.0	0

133	3.0	0
134	3.0	0
135	3.0	0
136	3.0	0
137	3.0	0
138	3.0	0
139	3.0	0
140	3.0	0
141	3.0	0
142	3.0	0
143	3.0	1
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154	3.0	0
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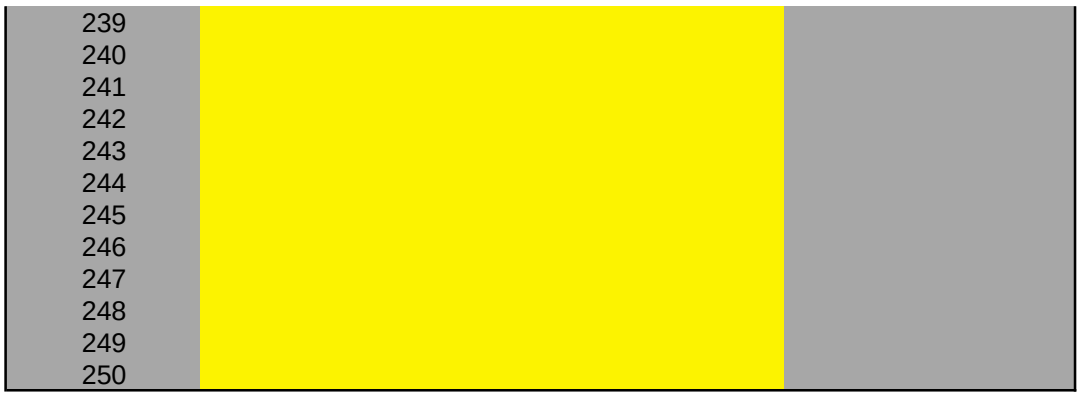
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Table 3. USFWS Desert Tortoise Pre-Project Survey Guidance

What is the estimated number of tortoises and associated 95% confidence interval for the action area?

INSTRUCTIONS ***Use this tab when all your transects were of equal length.***

Enter the appropriate values from the survey into the yellow cells below. The number of tortoises and assocated 95% confidence interval for the action area will be calculated.

N =	**42.4**
Lower 95%CI =	**19.41**
Upper 95%CI =	**92.52**
Total action area (acres)	**3000**
Prob that a tort is above ground given winter rainfall (Pa from Table 2) =	**0.800**
Total length of transects walked (L, km) =	**1080**
Transect length (km)	**10**
Number of transects walked (k) =	**108**
Number of tortoises found during surveys (n) =	**19**

Transects all the same length

Number of tortoises (n_i)	Number of transects on which (n_i) tortoises were seen
0	93
1	11
2	4
3	0
4	0
5	0
6	0
7	0
8	0
9	0

U.S. Fish and Wildlife Service
Nevada Fish and Wildlife Office
4701 N. Torrey Pines Drive
Las Vegas, NV 89130
Phone: 702-515-5230
Fax: 702-515-5231

http://www.fws.gov/nevada

U. S. Fish and Wildlife Service

Nevada Fish and Wildlife Office

Conserving the Biological Diversity of Great Basin, Eastern Sierra

PROTECTING BURROWING OWLS AT CONSTRUCTION SITES IN NEVADA'S MOJAVE DESERT REGION

Burrowing owl numbers are declining despite protection under the Migratory Bird Treaty Act. Killing or possessing these birds or destruction of their eggs or nest is prohibited.

Be part of the solution; help these owls!

Though burrowing owls are capable of digging their own burrows, they often will use burrows of other animals for shelter and nesting. They will even adopt pipes or culverts 6" to 8" in diameter.

Tips for Protecting Burrowing Owls, Their Eggs and Young at Construction Sites:

Even though burrowing owls are often active during the day, always check burrows, cracks, and crevices for owls before beginning construction. Use of a fiber-optic scope or remote mini-camera to look into a burrow can help determine the presence of owls or nests. Ensure owls and eggs are not present in burrows when grading begins, to avoid burying them.

In southern Nevada, owls breed from about mid-March through August. If a burrow has an active nest, the site must be avoided until the chicks have fledged. To ensure that birds will not abandon the nest, a buffer of at least a 250-foot radius should be placed around the burrow, within which no construction should occur. It takes a minimum of 74 days from when eggs are laid until chicks are able to fly (fledge). After the young have fledged, check the nest burrow for any owlets before resuming construction.

The following owl behaviors may help determine breeding or the presence of an active nest:

- **A pair of owls is initially observed at a site, then only one owl is observed**. This may indicate that the pair has chosen a nest burrow, and the female has gone down into the burrow to lay and incubate eggs. Once incubation begins the female rarely leaves the burrow.
- **An owl is frequently observed carrying food to the burrow**. The male provides food for the female while she is incubating eggs. The best time of day to observe owls is dawn and dusk, but they may be active throughout the day. The male will most likely leave the food in front of the burrow and the female will come to the entrance to take the food. This is probably the best indication that the owls have an active nest.
- **Only one owl has been seen for a period of time; then, two owls are observed.** This may indicate that either the nest has failed, or the eggs have hatched, and the female has emerged from the burrow to assist the male in hunting for food to feed the chicks. The chicks will appear at the burrow entrance when they are about 10 days old.

If you are unsure of breeding status, seek the assistance of a professional biologist or other knowledgeable person. Should breeding behavior be observed, presence of an active nest should be assumed and the area avoided until the chicks have fledged or the nest is no longer occupied.

IMPORTANT! In the Mojave Desert portions of Clark, southern Lincoln and Nye counties, owls may use desert tortoise burrows for nesting and shelter. Desert tortoises are protected under the Endangered Species Act. Killing, harming, or harassing desert tortoises, including destruction of their nests with eggs, without prior authorization is prohibited by Federal law.*

* IF YOUR PROJECT IS IN CLARK COUNTY, PLEASE READ ON:

Clark County holds a permit from the U.S. Fish & Wildlife Service authorizing "take" of desert tortoises during the course of otherwise legal activities on non-federal lands. **In Clark County only**, discouraging burrowing owls from breeding in the construction site on private property is allowed by collapsing tortoise burrow's during the owl's non-breeding season (September through February). This may help avoid construction delays. Prior to collapsing a burrow, always check for owls or other protected wildlife occupying the burrow for the winter. Call the Nevada Department of Wildlife at 702-486-5127 if a Gila monster is found as this is a State protected species.

Thank you for your assistance in protecting migratory birds and Nevada's endangered and threatened species!

Template and Guidance on Preparing an Initiation Package for Endangered Species Act Consultation[1]

This document is intended to provide a general template and guidance on the type and detail of information that should be provided to initiate consultation with US Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NOAA Fisheries Service). This document is formatted as a general template you can follow when preparing an initiation package. You may develop one document for projects that affect species under both NOAA Fisheries Service and USFWS jurisdiction[2], but it is often advisable to prepare separate documents for each agency to avoid confusion. This is not intended to be an exhaustive document as specific projects may require more or less information in order to initiate consultation. The amount of information is typically correlated with the complexity of the project and severity of impacts, but in any case, is at least the minimum amount of information necessary to support the conclusions of the document. Also, note that this document contains guidance on the information required to initiate formal consultation procedures with USFWS and/or NOAA Fisheries Service. Additional information needs may be identified during consultation. Texts in italics below are examples. Normal text is guidance. A glossary of terms (in ***bold, italic*** text) is appended.

Obviously, before you draft an initiation package, before you even know if an ESA consultation will be needed, you will need to have determined which species and critical habitat may be affected by the proposed action and any interrelated or interdependent actions. This "may affect" determination is the first trigger for an ESA section 7 consultation for federal actions. The first step in this determination is usually to request a list from USFWS and NOAA Fisheries Service of species and critical habitats that occur in the vicinity of your project. Alternatively, your records may already include this information or you can collect the information from websites maintained by USFWS and NOAA Fisheries Service. The next steps include reviewing the action area for proposed action (the determination of action area is described in section III below) and then reviewing the known, expected or possible occurrence of listed species and critical habitat within the action area. If there is overlap between a species or critical habitat occurrence and the action area, then the action "may affect" the listed species and/or critical habitat. Additional analysis (described in later sections of this document) will allow you to determine whether the exposure of the species or critical habitat to the action is likely to adversely affect the species or critical habitat.

1 Revised November 23, 2007

2 With some exceptions, generally, marine and anadromous species are under the jurisdiction of NOAA Fisheries Service. Terrestrial species and freshwater aquatic species are under the jurisdiction of USFWS.

I. INTRODUCTION

Here is an example of introductory language:

The purpose of this initiation package is to review the proposed [project name] in sufficient detail to determine to what extent the proposed action may affect any of the threatened, endangered, proposed, or sensitive species and designated or proposed critical habitats listed below. In addition, the following information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to listed and/or proposed species and designated and/or proposed critical habitat by proposed federal actions. This initiation package is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (50 CFR 402; 16 U.S.C. 1536 (c)).

Threatened, Endangered, Proposed Threatened or Proposed Endangered Species

Example language:

The following listed and proposed species may be affected[3] *by the proposed action:*

common name (Scientific name) ***T***

common name (Scientific name) ***E***

common name (Scientific name) ***PT***

common name (Scientific name) ***PE***

This list should include all of the species from the species lists you obtained from USFWS and NOAA Fisheries Service. If it doesn't, include a brief explanation here and a more detailed explanation in your record to help USFWS and NOAA Fisheries Service understand your thought process for excluding a species from consideration.

Candidate Species, Sensitive Species and Species of Concern (USFWS only)

Example language:

The following candidate species, sensitive species, and species of concern may be affected by the proposed action:

common name (Scientific name) [include state designation, if appropriate]

Any State-listed species should be included here, if they are not federally listed.

Do not forget that the ***action agency*** may have additional responsibilities to help prevent these species from becoming listed. Check your agency=s guidelines.

3 This document will discuss making the "may affect" and subsequent determinations in later sections.

Critical Habitat

Example language:

The action addressed within this document falls within Critical Habitat for [identify species].

II. CONSULTATION TO DATE

Consultation under the ESA consists of discussions between the action agency, the applicant (if any), and the USFWS and NOAA Fisheries Service. Consultation includes the sharing of information between all parties about the proposed action and related actions, the species and environments affected, and means of achieving project purposes while conserving the species and their habitats. Under the ESA, there can be both formal and informal consultation. The consultation process in each is similar, but formal consultation has statutory timeframes and other requirements (such as the submission of the information in this package). Informal consultation typically concludes after the action agency makes a determination that the action "***may affect, but is not likely to adversely affect***" listed species or critical habitat and USFWS and/or NOAA Fisheries Service concur with this determination in writing. Formal consultation typically occurs when the action agency makes a determination of "***may affect, likely to adversely affect***" and concludes when USFWS and/or NOAA Fisheries Service issue a biological opinion. Alternatively, formal consultation can also lead to incorporation of additional protective measures that render the project "not likely to adversely affect" listed species or designated critical habitat.

In this section, summarize any consultation that has occurred thus far. For example, prior to initiating formal consultation or requesting concurrence, agencies and applicants may engage in a period of technical assistance to discuss the project and develop avoidance, minimization, and conservation measures. Identify when consultation was requested (if not concurrent with this document). Be sure to summarize meetings, site visits and correspondence that were important to the decision-making process.

III. DESCRIPTION OF THE PROPOSED ACTION

The purpose of this section is to provide a clear and concise description of the proposed activity and any ***interrelated*** or ***interdependent*** actions.

The following information is necessary for the consultation process on an action:

1. The action agency proposing the action.

2. The authority(ies) the action agency will use to undertake, approve, or fund the action.

3. The applicant, if any.

4. The action to be authorized, funded, or carried out.

5. The location of the action.

5. When the action will occur, and how long it will last.

6. How the action will be carried out

7. The purpose of the action.

8. A description of any interrelated or interdependent actions, or that none exist to the best of your knowledge.

In other words, describe and specify: **WHO** is going to do the action and under what authority, include the name and office of the action agency and the name and address of the applicant; **WHAT** the project or action is; **WHERE** the project is (refer to attached maps); **WHEN** the action is going to take place, including time line and implementation schedules; **HOW** the action will be accomplished, including the various activities that comprise the whole action, the methods, and the types of equipment used; **WHY** the action is proposed, including its purpose and need; and **WHAT OTHER** interrelated and interdependent actions are known.

Include a clear description of all conservation measures and project mitigation such as avoidance measures, seasonal restrictions, compensation, restoration/creation (on-site and in-kind, off-site and in-kind, on-site and out-of-kind, off-site and out-of-kind), and use of mitigation or conservation banks.

Here are some examples of commonly overlooked items to include in your project description:

Type of project	Restoration areas
Project location	Conservation measures
Project footprint	Compensation and set-asides
Avoidance areas	Bank ratios and amounts
Start and end times	Mitigation: what kind and who is responsible?
Construction access	Dust, erosion, and sedimentation controls
Staging/laydown areas	Whether the project is growth-inducing or facilitates growth
Construction equipment and techniques	Whether the project is part of a larger project or plan
Permanent vs. temporary impacts	What permits will need to be obtained
Duration of “temporary” impacts	

Action Area

The ***action area*** is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.” The action area is not based simply on the Federal action and should not be limited to the location of the Federal action. The purpose of identifying this area is to provide a boundary around the area(s) in which the ***effects of the action*** will be felt. In this area, the physical, chemical, and biological changes resulting from the proposed action and any interrelated and interdependent actions are considered in context of existing conditions and activities to determine the resulting consequence to species

and critical habitat. The action area is defined by measurable or detectable changes in land, air and water, or other measurable factors that result from the proposed action and interrelated or interdependent actions. In this document, we call these measurable or detectable changes *stressors* (or *subsidies* in the case of changes you may consider beneficial to species and critical habitats). Please note that when defining the limits of measurable or detectable changes, the sensitivities and capabilities of the species and their habitats should be considered.

To determine the action area, we recommend that you first break the action down into its components (*e.g.,* vegetation clearing, construction of cofferdams, storage areas, borrow areas, operations, maintenance, etc.,). Determine the stressors that are expected to result from each component. For example, instream actions may mobilize sediments that travel downstream as increased turbidity and then settle out as sediments on the stream substrate. Sound levels from machinery may be detectable hundreds of feet, thousands of feet, or even miles away. Use these distances when delineating the extent of your action area. We also recommend that you subsequently "reconstruct" the action to assess the combined stressors and subsidies of the components. You may find that some stressors are synergistically minimized or avoided, whereas other stressors may increase or are magnified.

Finally, describe the action area, including features and habitat types. Include photographs and an area map as well as a vicinity map. The vicinity map for terrestrial projects should be at a 1:24,000 scale with the USGS quad name included.

IV. STATUS OF THE SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

The primary purpose of this section is to summarize relevant local information on the biological requirements of the species, population viability (trends, abundance, distribution, etc.,)[4], and condition of critical habitat. Some of this information will come from local sources, your records, or even information provided by USFWS or NOAA Fisheries Service. You will use this information to support your determination of the likelihood of adverse effects from the action. USFWS and/or NOAA Fisheries Service use this information to understand your reasoning and to supplement any additional information they consider as part of their decision to concur with your finding or to determine if the action is likely to jeopardize the listed species or result in the destruction or adverse modification of critical habitat[5].

Provide local information on affected individuals and populations, such as presence, numbers, life history, etc. For some large or complex actions, it may also help to identify any ongoing threats, limiting factors to species viability or habitat value, and implementation of any recovery actions that occur in the action area. If the species has a recovery plan, that document will contain additional information on species status threats, and actions needed to recover the species.

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4 For salmon species, NOAA Fisheries Service uses the concepts of Viable Salmonid Populations (VSP; McElhany *et al* 2000) to describe the status of the species populations and as a framework for assessing the effects of the action on the likelihood of both the survival and recovery of the species. The VSP framework focuses on the *abundance, population growth rate, diversity,* and *spatial structure* of populations to determine their viability.

5 The regulatory definition of critical habitat has been invalidated in several Federal Circuit Courts. The USFWS and NOAA Fisheries Service are drafting a revised regulatory definition. In the interim, both agencies consider the statutory definition and purpose of critical habitat when determining if an action is likely to result in destruction or adverse modification.

Important Biological Requirements: Include aspects of the species' biology that relate to the impact of the action, such as sensitivity to or tolerance of: noise, light, heat, cold, inundation, smoke, sediments, dust, etc. For example, if the species is sensitive to loud sounds or vibration, and your project involves loud tools or equipment, reference that aspect of their biology. Include citations for all sources of information. If a species is limited to a narrow thermal range and a narrow humidity range, show where in the action area the temperatures are sufficient to support the species, where the humidity is sufficient to support the species, and where those areas overlap.

Describe habitat use in terms of breeding (spawning), feeding, and sheltering. Also discuss habitat use patterns, including seasonal use and migration (if relevant), and identify habitat needs.

Include survey information. For all monitoring and survey reports, please clearly identify how it was done, when, where, and by whom. If survey protocols were followed, reference the name and date of the protocol. If survey protocols were modified, provide an explanation of how the surveying occurred and the reasoning for modifying the protocol.

Keep it relevant. It is unnecessary to discuss biology that is totally unrelated to project impacts--*e.g.*, discussion of pelage color, teat number, and number of digits fore and aft is irrelevant when the project is a seasonal wetland establishment.

Utilize the best scientific and commercial information available. Use and cite publications/journal articles/agency data and technical reports. Include local information, relative to the action area, views of recognized experts, results from recent studies, and information on life history, population dynamics, trends and distribution. Reference field notes, unpublished data, research in progress, etc.

V. ENVIRONMENTAL BASELINE AND CUMULATIVE EFFECTS

This section provides information which is then used along with the species and critical habitat information from the preceding section to describe the pre-action condition of the species and critical habitat that will be exposed to the stressors and subsidies of the action(s) under consultation. The purpose of this section is to provide a summary of the relevant local information on the impacts that other factors (human and natural) in the action area have had on the viability of the species and value of critical habitat. These other factors may have occurred in the past, may continue to affect the species and habitat today, or will affect the species and habitat in the future.

Environmental Baseline

Provide information on past, present and future state, local, private, or tribal activities in the action area: specifically, the positive or negative impacts those activities have had on the species or habitat in the area in terms of abundance, reproduction, distribution, diversity, and habitat quality or function. Include the impacts of past and present federal actions as well. For continuing actions, describe those impacts (to the species under consultation) that occurred from past existence of the action—including any operational actions that may have affected the species and are expected to continue to impact the species.

Relevant information such as habitat conditions at the site, habitat conditions between work areas and listed species locations, surrounding land-uses, hydrology and drainage patterns, and prevailing winds and expected seasonal shifts can all be presented to provide geographical foundation for your analysis of the effects of the action and your conclusions.

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated (*i.e.,* not interrelated or interdependent) to the proposed action are not considered in this analysis because they will be subject to separate consultation pursuant to section 7 of the Act. (Note: Cumulative effects under ESA are ***not*** the same as the definition under NEPA. Be careful not to mix them up[6].) Describe the impacts of these cumulative effects in terms of abundance, reproduction, distribution, diversity, and habitat quality or function.

Present all known and relative effects to population, *e.g.,* fish stocking, fishing, hunting, other recreation, illegal collecting, private wells, development, grazing, local trust programs, etc. Include impacts to the listed and proposed species in the area that you know are occurring and that are unrelated to your action--*e.g.,* road kills from off-road vehicle use, poaching, trespass, etc.

VI. EFFECTS OF THE ACTION

The purpose of this section is to document your analysis of the potential impacts the proposed action will have on species and/or critical habitats. This analysis has two possible conclusions for listed species and designated critical habitat:

(1) May Affect, Not Likely to Adversely Affect – the appropriate conclusion when effects on a listed species or critical habitat are expected to be *discountable, insignificant,* or completely *beneficial*.

Beneficial effects – contemporaneous positive effects without any adverse effects

Insignificant effects – relate to the size of the impact and should never reach the scale where take would occur.

Discountable effects – those that are extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

(2) May Affect, Likely to Adversely Affect – the appropriate finding if *any* adverse effect may occur to listed species or critical habitat as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial.

In the case of <u>proposed</u> species or <u>proposed</u> critical habitat, the possible conclusions are:

<u>Proposed Species</u>

6 Many cumulative effects under NEPA are addressed as effects of interdependent actions under ESA.

Likely to Jeopardize the Continued Existence

Not Likely to Jeopardize the Continued Existence

Proposed Critical Habitat

Likely to Destroy or Adversely Modify

Not Likely to Destroy or Adversely Modify

The effects analysis includes assessment of:

- Direct and indirect effects (including stressors and subsidies) of the action(s) under consultation, including conservation and minimization measures.
- Direct and indirect effects (including stressors and benefits) of interrelated or interdependent actions
- The effects of the action on the species when added to the environmental baseline and cumulative effects in the action area.

Under the ESA, direct effects are those that are caused by the action(s) and occur at the time of the action(s), and indirect effects are those that are caused by the action(s) and are later in time, but are still reasonably certain to occur. For an ongoing action, such as operation of a tidal gate, the distinction between direct and indirect effects may be difficult to finely distinguish. What is critical is that the scope of the analysis consider stressors and subsidies that occur beyond when (and where) an action initially occurs.

Based on the various components of your action that you used to determine the extent of the action area, this analysis assesses the potential stressors and subsidies resulting from each component and predicts the likely responses species and critical habitat that are exposed to those stressors and subsidies will have.

To determine a species' and/or habitat's probable response to an action, you must evaluate the magnitude and scope of the species and/or habitat's exposure to the stressors resulting from the action. The overlap between the species and critical habitat and the stressors resulting from the action determined which species and habitat the action "may affect." Now, this overlap is further examined to determine the nature of the exposure in order to determine the response or range of responses that are likely to occur. This assessment is similar to evaluations of the effects of a drug or toxin on a living creature. At certain levels of exposure to the chemical, the animal may show no response. At higher doses, the animal may exhibit illness or diseases like cancer. At even higher doses, or in doses combined with other factors, the animal may die. These responses (no response to death) have different consequences on the short and long term fitness of the animal. USFWS and NOAA Fisheries Service are especially concerned with responses that reduce an animal's reproductive success, growth, or life span.

Your conclusions of "not likely to adverse affect" or "likely to adversely affect" are based in large part on the responses you predict will occur based on the best scientific and commercial information.

To begin your prediction of responses, here is a basic set of questions you might answer:

- What are the specific stressors causing the exposure

- Where the exposure to the stressors would occur
- When the exposure to stressors would occur
- How long the exposure to stressors would occur
- What is the frequency of exposure to stressor
- What is the intensity of exposure to stressor
- How many individuals would be exposed
- Which populations those individuals represent
- What life stage would be exposed

For critical habitat, the questions would be similar but would focus on primary constituent elements of critical habitat.

Remember that exposure to a stressor is not always direct. For example, in some cases individuals of a species may be directly exposed to the sediment mobilized during construction. However, in other cases, individuals of the species would be exposed indirectly when sediment mobilized during construction settles out in downstream areas, rendering those areas unusable for later spawning or foraging.

Here are some examples of stressors you should address:

Exposure to abiotic factors affecting land, air, or water

Exposure to biotic factors affecting species behavior

Spatial or temporal changes in primary constituent elements of critical habitat

Loss or gain of habitat--direct and indirect

Fragmentation of habitat

Loss or gain of forage and/or foraging potential

Loss or gain of shelter/cover

Loss or gain of access through adjacent habitat/loss of corridors

Once you have examined the details of the exposure of species or critical habitat to an action, the next step is to determine the potential response or range of responses the exposed individuals or components of critical habitat will have to those levels and types of exposure.

This is where the use of the best scientific and commercial information available becomes crucial. Your analysis must take this information into consideration and the resulting document must reflect the use of this information and your reasoning and inference based on that information. Bear in mind that this analysis may not be the final word on the expected responses as further consultation with USFWS or NOAA Fisheries Service may refine this analysis.

Be sure to describe the expected responses clearly and focus your analysis towards determining if any of the possible responses will result in the death or injury of individuals, reduced reproductive success or capacity, or the temporary or permanent blockage or destruction of biologically significant habitats (*e.g.,* foraging, spawning, or lekking grounds; migratory

corridors, etc.,). Any of these above responses are likely to qualify as adverse effects. If the available information indicates that no observable response is expected from the levels and types of exposure, the action may be unlikely to adversely affect a species or critical habitat. However, remember that no observable response may actually mask an invisible internal response such as increased stress hormone levels, elevated heart rate, etc. Depending on the fitness of the exposed individual and the surrounding environment (including other threats), these "invisible" responses may lead to more serious consequences. We recommend working with your NOAA Fisheries Service or USFWS contact to determine the appropriate conclusion.

Don't forget to consider:

Individual responses based on the species biological requirements and sensitivity to exposure

The combined effects of existing threats (baseline) and exposure

Exposure and response of species and critical habitat to interrelated and interdependent actions

The combined stressors of the components of the action.

Any actions that are likely to result in the incidental take of a listed species are automatically considered "likely to adversely affect."

Understand and avoid common flaws in developing an affect determination. These common flaws are: the Displacement Approach (*i.e.*, the species will move out of the way; there are plenty of places for them to go); the Not Known to Occur Here Approach (*i.e.*, looking at survey results, or lack of results to determine presence in spite of other information or conditions that predict the species would occur on site); the Well Tell You Later Approach (*i.e.*, if we find any, then well let you know and that is when we will consult); or the Leap of Faith Approach (*i.e.*, the agency wants the USFWS or NOAA Fisheries Service to accept a determination based on trust, rather than the best scientific and commercially available information.). In all of these cases, projects have been stalled or delayed when the species showed up in the work area and consultation had to be re-initiated just prior to project initiation or during project work.

Here are some examples of effects:

Loss of habitat--direct and indirect

Mortality

Harassment

Disrupted reproduction and/or loss of reproduction

Loss of forage and/or foraging potential

Loss of shelter/cover

Loss of access through adjacent habitat/loss of corridors

Noise/light during construction

Noise/light after construction

Fragmentation of habitat

Urbanization induced or facilitated by the action

Increased predation, including predation by pets and feral animals

Impacted water quality (increased runoff, sedimentation, altered hydrology)

Analysis of alternate actions

This analysis is required for actions that involve preparation of an EIS. For all other actions, a summary of alternatives discussed in other environmental documents is useful to understanding the purposes of the action and other feasible (or infeasible) methods to accomplish that purpose.

VII. OTHER RELEVANT INFORMATION

Provide any other relevant available information the action, the affected listed species, or critical habitat. This could include local research, studies on the species that have preliminary results, and scientific and commercial information on aspects of the project.

VIII. CONCLUSION

This is where you put your overall effect determination after you have analyzed the exposure and response of species and habitat to the stressors resulting from the proposed action and interrelated or interdependent actions. Effect determinations must be based on a sound reasoning from exposure to response and must be consistent with types of actions in the project description, the biology in the species accounts, the habitat status and condition, changes to the existing environment, and the best scientific and commercial information available.

Again, the two potential conclusions for **listed species** are:

Not likely to adversely affect species

Likely to adversely affect species

The two potential conclusions for **designated critical habitat** are:

Not likely to adversely affect critical habitat

Likely to adversely affect critical habitat

The two potential conclusions for **proposed species** are:

Not likely to jeopardize species

Likely to adversely jeopardize species

The two potential conclusions for **proposed critical habitat** are:

Not likely to destroy or adversely modify critical habitat

Likely to destroy or adversely modify critical habitat

Include the basis for the conclusion, such as discussion of any specific measures or features of the project that support the conclusion and discussion of species expected response, status, biology, or baseline conditions that also support conclusion.

If you make a "No effect" determination for another species or critical habitat, it doesn't need to be in the assessment you send to USFWS and/or NOAA Fisheries Service. However, because you might have to defend it that determination keep the documentation of your reasoning in your administrative record.

IX. LIST OF DOCUMENTS

Provide a list of the documents that have bearing on the project or the consultation, this includes relevant reports, including any environmental impact statements, environmental assessment, or biological assessment prepared for the project. Include all planning documents as well as the documents prepared in conformance with state environmental laws

IMPORTATANT NOTE: Each of these documents must be provided with the initiation package consultation for the Services to be able to proceed with formal consultation.

X. LITERATURE CITED

We are all charged with using the best scientific and commercial information available. To demonstrate you did this, it is a good idea to keep copies of search requests in your record. If you used a personal communication as a reference, include the contact information (name, address, phone number, affiliation) in your record.

XI. LIST OF CONTACTS/CONTRIBUTORS/PREPARERS

Please include contact information for contributors and preparers as well as local experts contacted for species or habitat information.

GLOSSARY

Action Agency – the federal agency that proposes to "authorize, fund, or carry out" an action that will be subject to ESA section 7 consultation.

Action Area - all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action.

Cumulative Effects – are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur in the action area of the Federal action subject to consultation.

Effects of the Action – refers to the direct and *indirect effects* of an action on the species or critical habitat, together with the effects of other activities that are *interrelated* or *interdependent* with that action, that will be added to the environmental baseline.

Indirect Effects - Indirect effects are those that are caused by the action(s) and are later in time, but are still reasonably certain to occur

Interrelated Actions - Interrelated actions are those that are part of a larger action and depend on the larger action for their justification– *i.e.* the action under consultation and related actions would not occur "but for" a larger action.

Interdependent Actions - Interdependent actions are those that have no significant independent utility apart from the action that is under consideration– *i.e.* other actions would not occur "but for" the action under consultation.

Environmental Baseline – includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process.

Likely to jeopardize the continued existence of – to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.

May Affect, Not Likely to Adversely Affect – the appropriate conclusion when effects on a listed species or critical habitat are expected to be *discountable*, *insignificant*, or completely *beneficial*.

Beneficial effects – contemporaneous positive effects without any adverse effects

Insignificant effects – relate to the size of the impact and should never reach the scale where take would occur.

Discountable effects – those that are extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

May Affect, Likely to Adversely Affect – the appropriate finding if any adverse effect may occur to listed species or critical habitat as a direct or indirect result of the proposed

action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial.

Common Flaws in Developing an Effect Determination

The preamble for the section 7 regulations (page 19949) states that projects found to have beneficial, insignificant, or discountable effects on listed species may be approved by the Service through the informal consultation process. Service approval is contingent upon the biological assessment (or BA) providing an adequate justification for the effect determination. Quite often, the Service must decide whether to concur with and effect determination without adequate supporting information. The determination may be correct, but the Service cannot make the "leap of faith" to accept it without supporting evidence and rationale. This is an important point that often delays the informal consultation process.

Quite frequently, effect determinations aren't necessarily *wrong*; they simply aren't justified in the assessment. The assessment should lead the reviewer through a discussion of effects to a logical, well-supported conclusion. For example, certain arguments might justify a "may affect, but not likely to adversely affect" call, but do not support the often-chosen "no effect" determination. It is important to remember that "no effect" means literally *no effect*, not a *small* effect or an effect that is *unlikely* to occur. If effects are insignificant (in size) or discountable (extremely unlikely), a "may affect, but not likely to adversely affect" determination is probably appropriate. Examples of arguments commonly used to justify effect determination follow.

The "Displacement" Approach: This relates to the argument that removal of habitat or disturbance of individuals is a "not likely to adversely affect" or a "no effect" because individuals can simply go elsewhere. Except for wide-ranging species such as grizzly bears, gray wolves, and bald eagles, this argument is usually unacceptable. When the argument *is* used, some rationale must be provided to indicate there are adequate refugia available and the impact will not occur during denning or nesting periods. In any case, a "no effect" call in these situations is usually inappropriate. The species will be affected but, depending on the situation, perhaps not adversely so.

The "Not Known to Occur Here" Approach: The operative word here is "known". Unless adequate surveys have been conducted or adequate information sources have been referenced, this statement is difficult to interpret. It begs the questions "Have you looked?" and "*How* have you looked?". Always reference your information sources. Have you queried the Washington Department of Wildlife's Database, for example? Species occurrence information that is generated through one day/year surveys (i.e., the mid-winter bald eagle counts) or "wildlife observation cards" (which more closely reflect the location of *people*, for example) are usually inadequate to justify species absence. Bald eagle nest sites are surveyed yearly by the State and this information is usually up-to-date and reliable. In situations where wide-ranging species are difficult to census (i.e., grizzly bear and gray wolf), however, it is advisable to assume species presence if the habitat is present. The timing of surveys is also important. Consider the life history of the species when scheduling surveys. Many plants are only identifiable while flowering, for example. And mid-winter bald eagle counts conducted once a year are inadequate for locating roost or nest areas.

The "We'll Contact You Later" or the "C-clause" Approach: This is often used by Forest Service biologists to justify a no effect call. It basically says "If the species is later found within the

project area, the C6.25 contract clause will come to the rescue." This offers little assurance that the species will not be affected by the project prior to being "discovered."

The "Leap of Faith" Approach: This refers to the assumption of some biologists that the Fish and Wildlife Service reviewer is familiar with the project and/or its location, and there is no need to fully explain the impact the project may have on listed species. Usually, there is little or no connection or rationale provided to lead the reader from the project description to the effect determination. Remember the Far Side comic that shows a professor writing lengthy formulas on the blackboard with the phrase "*A miracle occurs here*" stuck in somewhere to make his theory "work"? We cannot assume conditions that are not presented in the assessment. Doing so would leave both the project proponent and the Service at risk of challenge by third parties that do not necessarily share in or trust our good working relationship.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE
MANUAL TRANSMITTAL SHEET

Release: 1-242

Date: 09/13/2001

Subject: 1745 - Native Plant Materials Manual

1. Explanation of Material Transmitted: This material contained in this Manual Supplement complements Handbook H-1745 and provides policy and guidance for the use of native plant materials in California.

2. Reports Required: None

3. Materials Superseded: None

4. Filing Instructions: File as directed below.

REMOVE:	INSERT: Release 1-242
None	1745
	(Total: 2 sheets, double-sided)

for State Director

1745-NATIVE PLANT MATERIAL MANUAL

Table of Contents

1745-NATIVE PLANT MATERIAL MANUAL

.01 Purpose. The purpose of this Manual Supplement is to provide policy and guidance specific to the use of native plants and plant seed in restoration and other revegetation projects. The maintenance of diverse native plant communities of California on a long-term basis is an essential part of preserving ecosystem health and productivity, and the introduction of persistent non-natives is clearly contrary to this goal.

Whenever plant materials are used in management activities such as erosion control, water quality, or restoration projects (including reclamation and rehabilitation), consideration needs to be given to long-term plant community stability and integrity. The selection of genetically appropriate native seeds and plants which achieve the purpose of the planting is therefore a concern. These guidelines establish policy on the use of native plant materials on BLM lands under the jurisdiction of the California State Office.

.02 Objectives. The objectives are:

A. To maintain and restore native plant communities with emphasis on the local genetic composition.

B. To use local plant materials for vegetation projects such as erosion control, fire rehabilitation, forage enhancement, water quality, and restoration whenever feasible and appropriate.

C. To prevent the introduction of undesirable vegetation into native plant communities.

D. To develop improved techniques for native plant restoration.

.03 Authority.

A. The Federal Land Policy and Management Act of 1976, as amended (43#U.S.C. 1701 et seq.).

B. Executive Order 13112 of February 3, 1999.

C. Departmental Manual 235.1.1.A., General Program Delegation, Director, Bureau of Land Management

D. BLM Manual 1203.3, Redelegation of Authority in State Directors.

E. BLM Manual 1745 - Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants.

1745-NATIVE PLANT MATERIAL MANUAL

.04 Responsibility.

E. The State Director is responsible for:

1. Overall implementation of the policy on the use of Native Plant Materials in California.

2. Periodically reviewing the policy and handbook and revising as appropriate.

B. Field Managers are responsible for:

1. Implementing the policy on the use of Native Plant Materials in their respective areas of jurisdiction.

.05 Policy. The policy of BLM-California is as follows:

A. To the maximum extent possible, germplasm of native species that is adapted to specific abiotic and biotic site conditions shall be used in revegetation efforts.

B. Use of non-local, native or non-native plant materials will occur only when no other feasible alternative exists, or unusual ecological circumstances dictate that their use is superior.

C. All revegetation projects shall incorporate good practices of early planning, peer evaluation, maintenance, monitoring, and annual reporting to ensure project success. This policy applies to BLM projects and all projects that occur on BLM land (ROWs, easements, etc.)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE
MANUAL TRANSMITTAL SHEET

Release: 1-243

Date: 09/13/2001

Subject: H- 1745 -1 - Native Plant Materials Handbook

1. Explanation of Material Transmitted: This release transmits the Bureau of Land Management's (BLM) CA-Handbook-Use of Native Plant Materials in California. It provides policy and guidance specific to the use of native plant and plant seed in restoration and other revegetation projects, to ensure the preservation of healthy and productive ecosystems. It directs the use of local plant materials for vegetation projects whenever feasible and appropriate, and gives guidance on improved techniques for native plant restoration. It also provides guidance to prevent the introduction of undesirable vegetation, while emphasizing the use of local genetic composition when restoring native plant communities

2. Reports Required: None

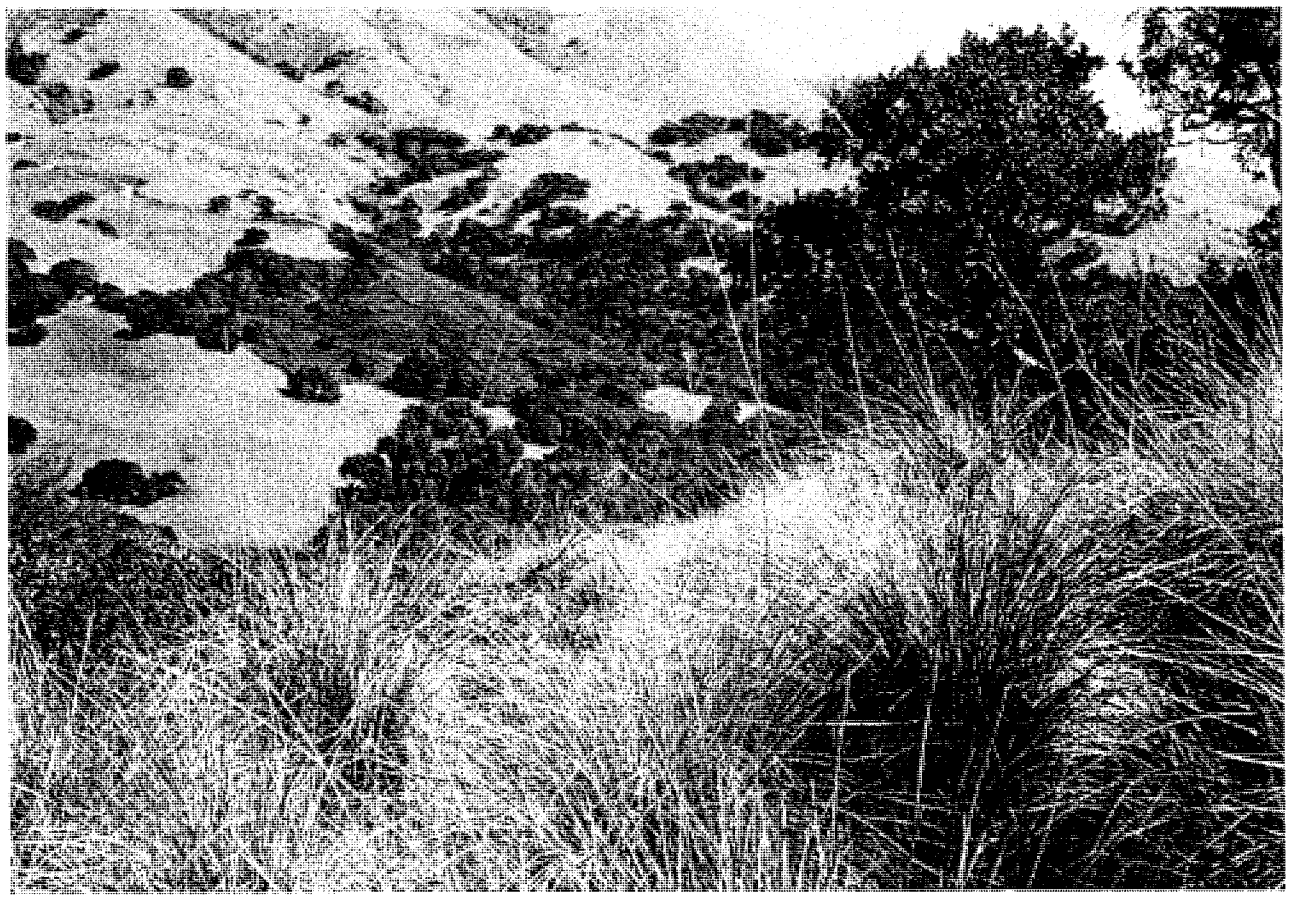
3. Materials Superseded: None

4. Filing Instructions: File as directed below.

REMOVE:	INSERT: Release 1-243
None	H-1745
	(Total: 8 sheets, double-sided)

/s/ James Wells Abbott
FOR State Director

USE OF NATIVE PLANT MATERIALS IN CALIFORNIA



Festuca californica Photo By: G.F. Hrusa, Ca. Dept. of Food and Ag

BLM MANUAL HANDBOOK-1745 -1

H-1745-1-NATIVE PLANT MATERIALS HANDBOOK

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H-1745-1-NATIVE PLANT MATERIALS HANDBOOK

CHAPTER I

I. INTRODUCTION

This handbook provides direction on the use of native plants and plant seed in restoration and other revegetation projects. The maintenance of diverse native plant communities on a long-term basis is an essential part of preserving ecosystem health and productivity, and the introduction of persistent non-native plants is clearly contrary to this goal. The handbook expands on the policy elaborated in California BLM Manual Supplement 1745 and establishes the procedures to be used in complying with that policy.

Whenever plant materials are used in management activities such as erosion control, water quality, or restoration projects (including reclamation and rehabilitation), consideration needs to be given to long-term plant community stability and integrity. The selection of genetically appropriate native seeds and plants which achieve the purpose of the planting is therefore a concern. These guidelines establish policy on the use of native plant materials on BLM lands under the jurisdiction of the California State Office.

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H-1745-1-NATIVE PLANT MATERIALS HANDBOOK

CHAPTER II

II. GENERAL GUIDELINES

A. Planning Stage:

1. Vegetation projects must be planned and evaluated early - preferably several years before the project start date. Seed set may not occur every year, or it may be sparse, so seed collection and stockpiling should begin as early as possible. If nursery grown seedlings are required, allow plenty of time for seed stratification and growing out. Early consideration should also be given to soil stockpiling, erosion control methods, and on-site planting and maintenance activities.

2. Determine the purpose of the planting and set your revegetation goals. If the disturbance has not yet occurred, take measurements of plant composition, density, and cover. Use soil surveys, if available, and look at soil series and ecological sites within the project area as well as the potential natural communities of the site. If this baseline information is not available for the project area, try to find a reference area that is undisturbed and ecologically similar to the project area. Decide what sort of progress can realistically be made toward the desired plant community, and what time-scale you will use to measure progress reports being used to record methodology and results.

3. Determine the desired plant species, the collection method (seeds or cuttings), the amount needed, and the planting method (seeding or transplanting). If nursery services are required, keep in mind that some nurseries require a year or more advance notification.

4. Determine through literature review and personal contacts techniques applicable to the life form you are collecting material from, transplanting, and/or seeding.

5. Develop quality standards for collecting, storing, growing, and outplanting.

6. Develop plans for long-term maintenance and yearly monitoring of the restored area.

7. Develop a contingency plan in case the plant materials become unavailable or fail to survive in the field. Seed availability may be a limiting factor for some species, so several different species should be considered. It is wise to try a variety of restoration methods to increase the odds of success and to determine the best overall method.

8. Maintain an ongoing stock of seed or vegetative materials from frequently used local species in each elevation band within a subsection (see II.D.1, below) if possible, in order to aid in the success of unexpected restoration projects. Meticulous records must be kept on the source

of all materials. A central collection facility may be more advantageous if the source areas are carefully controlled and monitored.

B. Project Review:

All restoration planning efforts must include coordination with Field Office Restoration Coordinators to ensure that the project is feasible and the appropriate plants and methods are used. Coordination with State Office Restoration Coordinators and knowledgeable individuals in other Federal and State agencies and the academic community is also highly desirable.

C. Natural Regeneration:

If there is an ample seed source and suitable conditions, natural regeneration should be encouraged. Topsoil should be salvaged and re-spread if possible, as native seeds and microbiota can often be preserved (if storage length is limited). Erosion control can often be achieved in the interim stage through the use of weed-free mulches such as native grass straw, barley straw, rice hulls, bark, and almond shells.

D. Plant Material Collection:

1. Local Plant Source: To the maximum extent possible, seeds and plants used in restoration, erosion control, fire rehabilitation, forage enhancement, and other projects shall originate from local sources. Local sources often possess genotypes that are adapted to the local environment, leading to higher short-term and long-term success rates. "Local" refers to sources within or as close as possible to the project area and within the same subsection (as shown on the Ecological Units of California map; see definitions), and elevation band (within 500') as the project area. Collections should also be made within the same vegetation series and general soil type.

If the plant population is known to be genetically rare, occurs on an unusual soil (e.g., serpentine), is found in an extreme environment (high temperature, low precipitation, etc.), or has distinct morphological characteristics that may be genetically based, then seeds/cuttings shall only be taken from these local variants. For example, a restoration effort on serpentine soil would use only seeds/cuttings collected on serpentine soil from within the same subsection and elevation band. In addition, disjunct plant populations may be genetically distinct and seeds/cuttings should be taken from within the disjunct population. Riparian species should be collected from riparian areas immediately upstream or downstream, or within sub-watersheds within the same subsection and at similar elevations. If a locally rare species is desired for use in revegetation and can only be collected from the wild, consider whether the local populations can support the impacts of collecting seed or propagules.

These guidelines can and should be tailored to individual species. Variation observed within a species is not always due to population differences; it could be a result of individual

plant differences, individual seed differences (from the same plant), and collection date differences. The use of common gardens, outplantings, and genetic analysis can be helpful in determining the presence and distribution of ecotypes, and should be done by experienced personnel. Large phenotypic plasticity would indicate that wide seed collection zones would be allowable, while large genetic variability would indicate the use of local ecotypes. Research on the genetic variability of commonly used revegetation species is therefore recommended and encouraged. (Extreme caution should be used in interpreting the results of 1) an isozyme study alone or 2) poorly researched taxa.) As ecotype information becomes available, restoration coordinators should develop seed collection "eco-zones" that will be incorporated into future versions of this policy.

2. Semi-local Plant Source: If sufficient numbers of widely-spaced source plants are unavailable within the same subsection, additional collection should occur in several well distributed sub-populations that have similar environments and are within adjacent subsections within the same section as the project area. Semi-local collection sites should be matched carefully to the project area in terms of elevation, vegetation series, aspect, slope, rainfall, annual temperature patterns, frost dates, and soil type. If plant materials are not available within the same section, consider postponing the project until native sources become available.

3. General: Try to use several (~ 50 or more) unrelated (spaced at least 1/4 mile apart) source plants within the collection area in order to maximize genetic diversity. Collect in areas that match the ecological characteristics of the project area. Only use healthy source plants. Collect seed when it is mature and still on the plant (if possible). For those plants that disperse their seed quickly at maturity, spreading sheets beneath the parent plant is advised. Obtain cuttings at the appropriate time of year and from material that is not too soft. Rapidly growing soft tissue is high in nitrogen and will not produce the auxins needed to root as opposed to more mature, woodier tissue that contains higher ratios of stored carbohydrates. Try to collect an equal number of seeds/cuttings from each source plant. Document the location of all source populations, track the plant materials taken from each population until they reach the field, and monitor the performance of each collection over time. This applies to commercial sources as well. When contracting out for seed collection, make sure the collector is well known, knowledgeable, and respected, and only pay for pounds of PURE LIVE SEED. If collected seeds are grown out in a nursery, make sure that the contract states that the seeds are government property, and cannot be used for commercial purposes. No federally-listed or proposed species shall be used for revegetation without proper coordination with the Fish and Wildlife Service. Consult with the California Department of Fish and Game if state-listed species are being considered for use.

E. Commercial Sources:

If local or semi-local plant sources are unavailable, commercial sources of native plants may be used. Plant materials should be bred and/or grown under environmental conditions that

are similar to the project area. Ideally, plant sources should be within the same section as the project area. Plant materials should only be moved from one section to another after careful evaluation. Only use commercial sources if the genetic origin is known. Above all, make sure to ask seed companies where the seed was collected, instead of telling them where you need it from! Be sure that nursery produced native seed was not grown under conditions that could have allowed hybridization with other species or other collections of the same species. Commercial sources should be used as an interim measure, using short-lived species, while adequate supplies of local or semi-local plant materials are being collected or grown.

F. Non-Natives:

Although native plants should always be given first consideration, there are certain situations where non-natives may be desired. For example, on highly disturbed sites that have had their physical characteristics altered so that native vegetation can no longer survive, it may be necessary to use non-natives to help restore site stability. Other examples that have been cited include noxious weed control and emergency situations. In cases where the use of non-native vegetation is desired, a justification shall be submitted for approval by the State Director (as outlined in BLM Manual 1745 - Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants). All non-native vegetation used should be non-invasive and ideally be short-lived, have low reproductive capabilities, or be self-pollinating in order to prevent gene flow into the native community. One good example is sterile oats, which provide erosion control and will fade out in one year without cultivation (although they do release seed if disturbed). Non-native vegetation should not compete with the naturally occurring native plant community, invade plant communities outside the target area, persist in the target ecosystem over the long term, or exchange genetic material with local native plant species. One approach to selecting such species may be to use genera that do not occur in the target area as there is less likelihood of genetic exchange between genera than between species within a genus. The use of non-natives should be considered as an interim measure only, while local or semi-local sources are developed. Cultivars of native plants produced outside of California require the same justification as non-natives. Non-natives listed in the Department of Food and Agriculture's Noxious Weed Species list or the California Exotic Pest Plant Council's list of wildland weeds shall not be considered for use under any circumstances.

G. Seed Quality:

All seeds/plants used for BLM projects shall be tested for weeds, pests and diseases, and shall be processed, stored, and conditioned properly. Due to the threat of complete project failure, 0% weed species and other crop species is required in seed mixtures (see BLM Manual 9015 - Integrated Weed Management). However, if it can be shown that a certain percent of contamination of a weed species or other crop species does not interfere with native plant establishment and is not persistent in the environment, then this level will be raised on a species basis.

H. Seed Storage:

Seed storage requirements are highly variable for each species. Generally, each 1% reduction in seed moisture and each 10 ° F reduction in seed temperature doubles the life of the seed. If you wish to store the seeds for 3-5 years at ambient temperatures, dry the seeds to between 5-8% moisture content before tightly sealing in durable containers. For longer storage, dry to 2.5-5% moisture. Make sure you properly label each container with information on species, location of source plant, environmental information, date of collection, and the collector, as a minimum.

I. Planting and Maintenance:

1. If direct seeding, consider using pits or imprinted areas to improve germination, mulches to improve survival, and cracked wheat to reduce granivory. High seeding rates are usually recommended, since direct seeding success rates are lower than transplanting.

2. If transplanting, consider using a variety of container sizes, and try to transplant quickly (preferably in one day). If containers are limited, place more near the windward side of the project area to maximize effectiveness.

3. Plant at an optimal time - usually at the start of the rainy season. A knowledgeable restoration specialist should be consulted if irrigation will be necessary.

4. Permits for projects involving restoration must contain a requirement for maintenance and monitoring of the restored area.

5. Track the success or failure of all restoration projects. An annual report on the status of all restoration projects is required. Even failed efforts yield useful information.

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H-1745-1-NATIVE PLANT MATERIALS HANDBOOK

CHAPTER III

III. ANNUAL REVIEW

This policy will be reviewed by Field Office and State Restoration coordinators on at least an annual basis, at which time the annual reports will be reviewed as well. The current guidelines for seed collection zones and seed purity are general, and future revisions will be needed to outline regional or species-specific standards.

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H-1745-1-NATIVE PLANT MATERIALS HANDBOOK

CHAPTER IV

IV. DEFINITIONS

Ecological Units of California: Map developed by the Forest Service and Natural Resource Conservation Service in 1994. Subsection units have similar surficial geology. lithology, geomorphic process, soil groups. Subregional climate, and potential natural communities.

Exotic or Non-native Species: One that was introduced through human activity.

Genetically Local Source: Plant material that originated at or within the same subsection and elevation band as the project site.

Native Plant: One that occurs and has evolved naturally in California, and in the project area, as determined by climate, soil, and biotic factors, and that was not introduced by human activity.

Revegetation: A general term for renewing the vegetation on a project site, which may include restoration and rehabilitation.

Stand: Aggregation of individual plants separated rom other such aggregations so that cross fertilization rarely occurs (if at all).

Undesirable Plant: May be a non-native species, non-adapted source, genetically changed through selection in a foreign dissimilar environment, or possesses trait(s) that conflict with accomplishment of objectives.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
California State Office
2800 Cottage Way, Suite W-1623
Sacramento CA 95825
www.ca.blm.gov

July 7, 2009

In Reply Refer To:
6840, 6600, 1600 (CA930)P

EMS TRANSMISSION: 7/7/09
Instruction Memorandum **No. CA-2009-026**
Expires: 09/30/2010

To: All District Managers and Field Managers

From: State Director

Subject: Survey Protocols Required for NEPA and ESA Compliance for BLM Special Status Plant Species

Purpose: The purpose of this Instruction Memorandum (IM) is to provide guidance on the requirements for conducting special status plant species surveys/inventories for ground disturbing projects. Inventories are conducted for many reasons; however, for the purpose of this document only one inventory "reason" is addressed:

> To ensure compliance with the National Environmental Policy Act and the Endangered Species Act by having sufficient information available to adequately assess the effects of proposed actions on special status plants. Assessments of the effects of these actions are documented in biological assessments, if the project involves Federally listed species.

Background: In 1996 the Bureau of Land Management (BLM) California State Director signed the Special Status Plant Management Handbook 6840-1. This Handbook details survey and inventory protocols required by BLM CA. This IM and attached protocols supersede that section of the 6840-1 Handbook.

Policy: It is BLM policy to conduct inventories/surveys to determine the occurrence and status of all special status plant species on lands managed by BLM or affected by BLM actions. This includes proactive inventories directed toward developing plans or determining the status of plant species, as well as inventories conducted to determine the impacts of BLM planned or authorized actions on any special status plants that might be within the area of a proposed project. Such inventories/surveys are to be conducted at the time of year when such plant species can be found and positively identified.

The survey/inventory requirements apply to energy rights-of-way applications on Federal lands managed by the BLM in California and northwestern Nevada. Projects that include State or private lands or require State approval will likely also require conformance with the rare plant survey guidelines of the California Department of Fish and Game

(http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/guideplt.pdf).

For further information regarding this IM, please contact Christina Lund, State Botanist, at the California State Office, (916) 978-4638.

Signed by:
James Wesley Abbott
Acting State Director

Authenticated by:
Richard A. Erickson
Records Management

Attachment - 1
Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species (7 pp)

Survey Protocols Required for NEPA/ESA Compliance for BLM Special Status Plant Species

Policy

It is BLM policy to conduct inventories to determine the occurrence and status of all special status plant species on lands managed by BLM or affected by BLM actions. This includes pro-active inventories directed toward developing plans or determining the status of plant species, as well as inventories conducted to determine the impacts of BLM planned or authorized actions on any special status plants that might be within the area of a proposed project. Such inventories are to be conducted at the time of year when such plant species can be found and positively identified.

Definition and Purpose

Inventory is the periodic and systematic collection of data on the distribution, condition, trend, and utilization of special status plant species (BLM Manual 6600).

Inventories are conducted for many reasons; however, for the purpose of this document only one inventory "reason" is addressed:

> To ensure compliance with the National Environmental Policy Act and the Endangered Species Act by having sufficient information available to adequately assess the effects of proposed actions on special status plants. Assessments of the effects of these actions are documented in biological assessments (if the project involves Federally listed species and qualifies as a "major construction activity" as defined by the ESA).

Special status plants include plant taxa that are Federally listed as threatened and endangered, proposed for Federal listing, candidates for Federal listing, State listed as rare, threatened, or endangered, or BLM sensitive species. All plant species that are currently on List 1B of the California Native Plant Society's Inventory of Rare and Endangered Plants of California (http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi), are BLM sensitive species, along with others that have been designated by the California State Director. BLM is party to a Memorandum of Understanding with the California Department of Fish and Game to collect information for inclusion in the California Natural Diversity Data Base. Therefore, in addition to inventorying for plants formally recognized as special status species by BLM, contractors must also inventory for all plant, lichen, and fungi species recognized as "special" by the California Natural Diversity Data Base (http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPPlants.pdf). Although the following discussion uses the term "special status plants," it should be interpreted to mean all of the plant taxa discussed above.

The inventory requirements below apply to energy rights-of-way applications on Federal lands managed by the BLM in California and northwestern Nevada. Projects that include State or private lands or require State approval will likely also require conformance with the rare plant

survey guidelines of the California Department of Fish and Game (http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/guideplt.pdf).

Timing and Intensity of Inventory

Before conducting inventories, contractors for BLM or energy companies should research three valuable sources to see if BLM special status species are known from the project area: the California Natural Diversity Data Base (CNDDB), CALFLORA, and the Biogeographic Information & Observation System (BIOS). However, CNDDB and BIOS are positive occurrence databases only, the lack of data should not be used as verification that the species does not exist in a given location. Inventories must be timed so that contractors can both locate and positively identify target plant species in the field. Inventories must be scheduled so that they will detect all special status species present. A single inventory on a single date will seldom suffice. For example, when one special status plant species suspected to be in the inventory can only be found and identified in April and another species can only be located and identified in August, at least two inventories are necessary. The first inventory can facilitate the second and/or third inventory, however, if potential sites for the late-flowering species are flagged during the first inventory. If sufficient information is available on the habitat requirements of potentially occurring species (substrate, plant community, etc.), and the site in question is believed to be unsuitable for those species, a field visit should still be conducted to document and validate the assumptions for believing that the species to be absent. In advance of the project site inventory, contractors should visit known populations of the target species in similar habitat conditions to determine current-year growth conditions and phenology. If, based on these visits to known populations, it appears likely that the project site inventory will fail to detect occurrences because of drought conditions (as may be the case for annual plant species or geophytic plants), BLM may require contractors to perform additional inventories in the following year.

Field Survey - Methodology

Field surveys will be floristic in nature, i.e., the contractor identifies every plant taxon observed in the project area to the taxonomic level necessary to determine rarity and listing status. Surveys will be conducted so that they will ensure a high likelihood of locating all the plant taxa in the project area. Depending on the size of the project area and the heterogeneity of the habitats within the project area, surveys will involve one or a combination of the following survey methods.

Complete Survey

A complete survey is a 100 percent visual examination of the project area (Figure 1) using transects. The length of the transect and distance between transects might change as the topography changes throughout the project area. Transects should be spaced so that all of the area between transects is visible and so that the smallest rare plant expected to occur is visible. The surveyor (1) compiles a species list while traversing the project area and keeps track of the plant community or habitat type where each taxon occurs; (2) maps the locations of all rare taxa

encountered using a GPS unit, and (3) fills out a CNDDB Native Species Field Survey Form for each location of each rare taxon encountered.

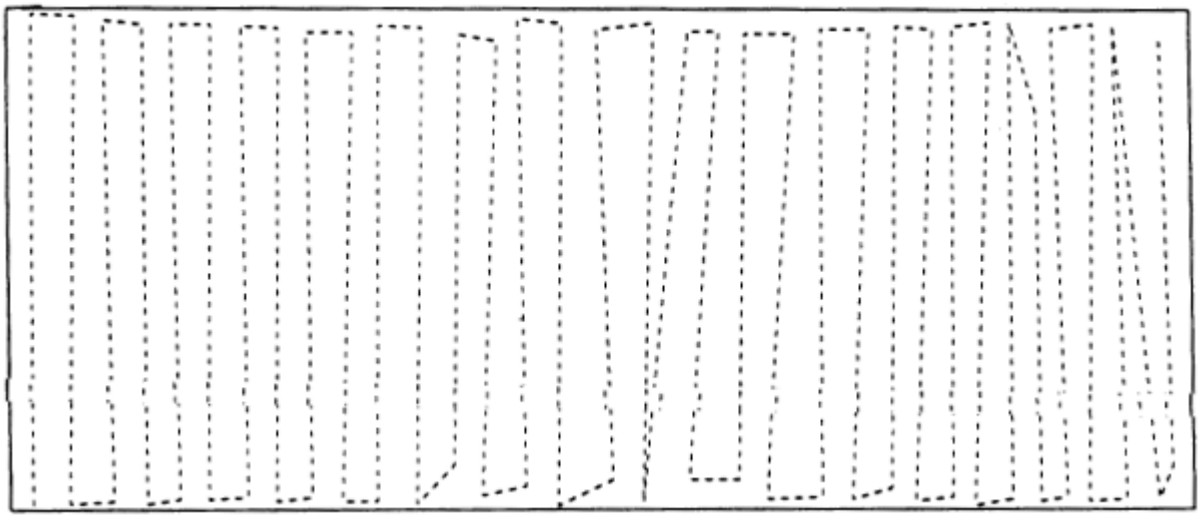

Figure 1. **Complete survey.**

Intuitive Controlled Survey

An intuitive controlled survey is a complete survey of habitats with the highest potential for supporting rare plant populations and a less intense survey of all other habitats present (Figure 2). This type of survey can only be accomplished by botanists familiar with the habitats of all the plant species that may reasonably be expected to occur in the project area. The botanist traverses through the project area enough to see a representative cross section of all the major plant habitats and topographic features. During the survey, the botanist compiles a species list of all plant taxa seen en route and keeps track of the plant community or habitat type where each taxon occurs. The surveyor maps the locations of all rare taxa encountered using a GPS unit and fills out a CNDDB Native Species Field Survey Form for each location of each rare taxon encountered. When the surveyor arrives at an area of "high potential" habitat, s/he surveys that area completely as described above and shown in Figure 1. High potential habitat areas include areas defined in a pre-field review of potential rare plants and habitat and other habitats where a rare species appears during the course of initial field work traversing the project area. Areas within the project area that are not the focus of a complete survey must be surveyed sufficiently so that is the botanist and BLM reasonably believe that few if any additional species would be added to the complete species list for the project area. The report must justify why the botanist did not consider these areas to have a high potential for supporting rare plant species and thus did not subject the area to a complete survey.

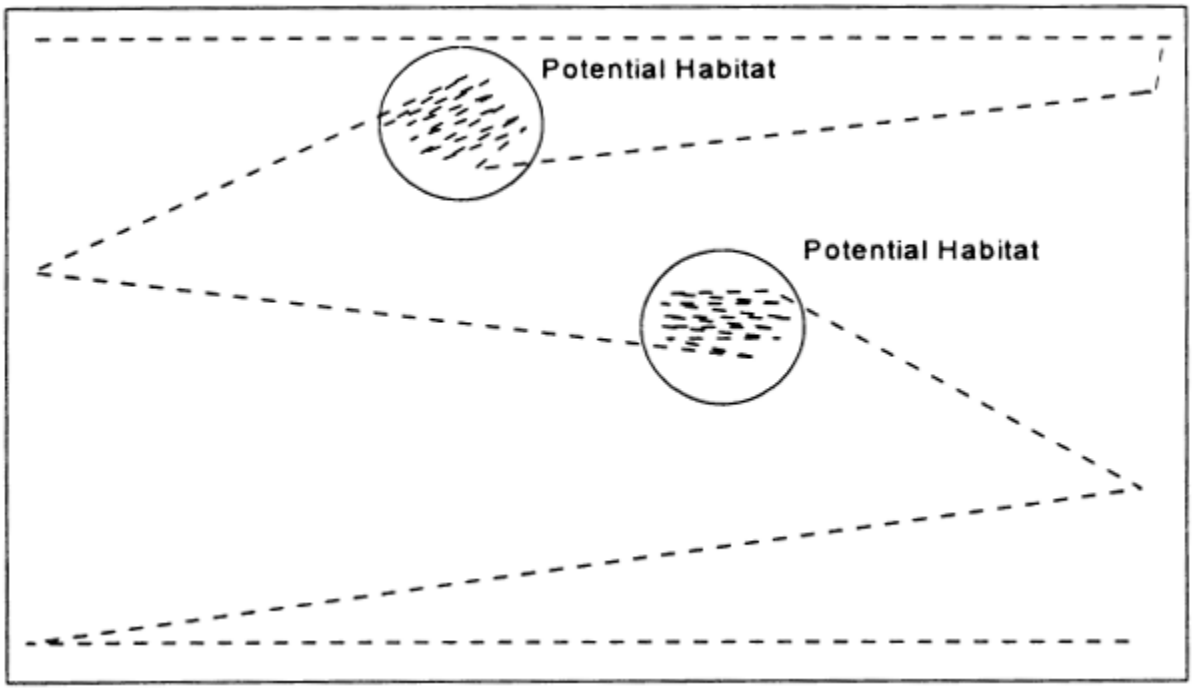

Figure 2. Intuitive Controlled Survey.

Documenting the Results of Inventory

The results of special status plant inventories should be well documented. This documentation must include as a minimum the completion and submission of Field Survey Forms and shapefiles/geodatabases of all special status plants found by BLM personnel or consultants. CNDDB defines occurrences as being separated from other plant locations by 0.25 mile. These forms are submitted to the BLM State Botanist and to the California Natural Diversity Data Base (CNDDB) at the following address:

CNDDB - Dept. of Fish and Game
1807 13th Street, Suite 202
Sacramento, CA 95811

Forms can be submitted electronically at: CNDDB@dfg.ca.gov
Copies of the Field Survey Form are available from the CNDDB at the same address. They will also provide photocopied parts of topo maps if needed.

If the inventory discovers any rare or unusual plant communities,[1] a Natural Community Field Survey Form must be completed for each such community and sent to the CNDDB at the address above.

[1] Rare or unusual plant communities includes those communities marked with asterisks in the most current list of California plant communities recognized by the California Natural Diversity Data Base, available at: http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/natcomlist.pdf, and Unusual Plant Assemblages as defined in

Most special status plant inventories of public lands conducted to assess the impacts of a project are performed by consultants hired by project proponents. These inventories must meet or exceed the intensity level required for the project by BLM. Personnel conducting the inventory must meet the qualifications outlined in this document. For BLM to adequately determine the quality of third party inventories, the following information must appear in a detailed report to BLM from the consultant or project proponent:

a. Project description, including a detailed map of the project location and study area.

b. A written description of the biological setting, including descriptions of the plant communities found in the project area and a vegetation map. Plant communities should be described and mapped to at least the alliance level using the vegetation classification system of the California Department of Fish and Game (CDFG). A list of the alliances currently recognized by CDFG can be found at: http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/NaturalCommunitiesList_Oct07.pdf. When the Manual of California Vegetation is published in 2009, the alliances recognized in that document should be used.

c. A detailed description of the inventory methodology, including techniques and intensity of the inventory and maps showing areas actually searched. This will also include areas searched but no special status plants found.

d. The results of the inventory.

e. The dates of the inventory.

f. An assessment of potential impacts and recommended mitigation measures to reduce impacts.

g. Recommended management actions to conserve any special status plants encountered should include both actions the BLM might take, as well as actions that might be taken by the FWS (listing or delisting of T/E plants, changes in candidate status, etc.).

h. A discussion of the significance of any special status plant occurrences found, with consideration for other nearby occurrences, and the distribution of the species as a whole.

i. Assessments of the health, population size, and protective status of any special status plants found.

j. A complete list of *all* plant species (not just special status species) identified within the project area, and a discussion of any range extensions discovered as a result of the inventory

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the California Desert Conservation Area Plan (http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/cdd/cdcaplan.Par.15259.File.dat/CA_Desert_.pdf) or shown on Map 6 of the California Desert Conservation Area Plan, as amended (copies on file at the BLM California State Office, the California Desert District, and each of the field offices in the California Desert District).

k. Copies of all Field Survey Forms, for all special status plant occurrences found, or Natural Community Field Survey Forms, for any unusual communities found.

l. The name(s) and qualifications of the persons conducting the inventory.

m. A list of references cited, persons contacted and herbaria visited.

n. Additional data needs.

o. Other information as appropriate such as vegetation maps and photographs (see below).

Voucher specimens of special status plants should be collected if necessary to conclusively document the occurrence of the species and if the collection will not adversely affect the health of the population at the site. Collection of Federally listed plants on Federal lands requires a permit from the FWS. If voucher specimens are collected, they should be deposited in major recognized herbaria for future reference, preferably The University of California, Berkeley (UC), The Jepson Herbarium (JEPS), The California Academy of Sciences (CAS), or Rancho Santa Ana Botanic Garden (RSA).

Photographs should be taken of the areas inventoried, of all special status plants found, and of the habitat associated with each special status plant occurrence.

Data Collection – Data Submission

Data should be collected using a Mapping Grade GPS Receiver with an accuracy of < 3 meters Horizontal Root Mean Squared (HRMS).

All positions should be logged according to the following specifications:

- Maximum PDOP of 6
- Minimum of 5 Satellites
- Minimum elevation mask of 15 degrees
- Datum: NAD83
- Coordinate System: UTM Zone 10 or Zone 11, depending on where in California or northwestern Nevada the data is collected.
- ESRI compliant formats (Geodatabase, Coverage or Shapefile)

Metadata must be included with the data. The following must be included in the metadata:

- Project Name
- Purpose – Summary of the intentions with which the data set was developed
- Abstract Information – Brief narrative summary of the data set
- Location – What area(s) does your data cover? ie., list statewide, regions, city, county?
- Developer – Who collected the data?

Data Dictionary – A data dictionary must be used for all projects. The dictionary should include the data that is requested on the CNDDB forms. This ensures that the botanist is collecting (electronically) the same data as is requested by DFG. This also ensures that all inventories are collecting the same level/standard of data.

GIS Support Data: BLM California State Office Downloadable Data Sources

Index Page with BLM Data Naming Rules
http://www.blm.gov/ca/pa/gis/Data_Page/Data%20Page.html

Geospatial Data Downloads
http://www.blm.gov/ca/gis/index.html

All data collected in and referenced to the public land survey are required to conform to this version of PLSS published on the California BLM data download page.

In addition to the local Field Office; a copy of the Data (DVD or CDROM) must be submitted directly to:

BLM California State Office
Geographic Services, W1939
Attention: Chief Mapping Sciences
2800 Cottage Way
Sacramento, CA 95825

GIS Questions: Please Call
(916) 978-4343

Qualifications of Personnel Conducting Inventories

All personnel conducting special status plant inventories must have the following:

- strong backgrounds in plant taxonomy and plant ecology
- strong background in field sampling design and methods
- knowledge of the floras of the inventory area including the special status plant species
- familiarity with natural communities of the area

These qualifications help ensure that all special status plants in the inventory area will be located, including taxa that BLM or project proponents did not predict at the start of the inventory. All survey efforts must be coordinated with the responsible BLM Field Office botanist or biologist

Appendix E:
California Guidelines for Reducing Impacts to Birds and Bats From Wind Energy Development

Below is the Executive Summary of the California Guidelines. The entire report can be found at <http://www.energy.ca.gov/windguidelines/index.html>

Executive Summary

Wind energy is expected to play a vital role in meeting California's renewable energy standards, which require that 20 percent of the electricity sold in California come from renewable energy resources by 2010. The California Energy Commission's *2004 Integrated Energy Policy Report Update* recommends a longer-term goal of 33 percent renewable energy by 2020. At the same time California moves to achieve its renewable energy commitments, it must also maintain and protect the state's wildlife resources. Specifically, wind energy development projects in California must avoid, minimize, and mitigate potential impacts to bird and bat populations. *California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development (Guidelines)* was developed to address these coexisting and sometimes conflicting objectives: to encourage the development of wind energy in the state while minimizing and mitigating harm to birds and bats.

The recommendations and protocols discussed in these voluntary *Guidelines* are suggestions for local permitting agencies to use at their discretion, and as a resource for other parties involved in the permitting process. Local governments are encouraged to integrate the recommended study methods described in the *Guidelines* with biological resource information and research unique to their region.

This document is a collaboration of the California Energy Commission (Energy Commission) and the California Department of Fish and Game (CDFG). In its *2005 Integrated Energy Policy Report*, the Energy Commission recommended the development of statewide protocols to address avian impacts from wind energy development. In 2006, many stakeholder participants at a workshop, "*Understanding and Resolving Bird and Bat Impacts,"* collectively requested such guidance. The resulting document provides a science-based approach for assessing the potential impacts that a wind energy project may have on bird and bat species and includes suggested measures to avoid, minimize, and mitigate identified impacts. CDFG and the Energy Commission encourage the use of the *Guidelines* for the biological assessment, mitigation, and monitoring of wind energy development projects and wind turbine repowering projects in California.

The objectives of the *Guidelines* are to provide information and protocols for assessing, evaluating, and determining the level of project effects on bird and bat species, and to develop and recommend impact avoidance, minimization, and mitigation measures. The document is organized around five basic project development steps:

1. Gather preliminary information and conduct site screening.
2. Determine the California Environmental Quality Act (CEQA), wildlife protection and permitting requirements.
3. Collect pre-permitting data using standardized monitoring protocol.
4. Identify potential impacts and mitigation for the permitting process.
5. Collect operations monitoring data using the standardized monitoring protocol.

Information in the *Guidelines* was specifically designed to be flexible to accommodate local and regional concerns, and the recommended protocols may need to be adjusted to accommodate unique, site-specific conditions. The protocols in the document are adaptable to address the specifics of each site such as frequency and type of bird and bat use, terrain, and availability of scientifically accepted data from nearby sources. For most projects, one year of pre-permitting surveys and two years of carcass searches during operations are recommended. However, a reduced level of survey effort may be warranted for certain categories of projects, such as infill development, some repowering projects, or projects contiguous to existing low-impact wind facilities. On the other hand, survey duration and intensity may need to be expanded for other kinds of projects, such as those with potential for impacts to special-status species, or for sites near wind energy projects known to have high impacts to birds or bats. Decisions on the level of survey effort need to be made in consultation with the CEQA lead agency, CDFG, U.S. Fish and Wildlife Service, and local conservation groups. The Energy Commission and CDFG propose to establish a statewide standing science advisory committee that could also provide information to lead agencies seeking additional scientific expertise. The advisory committee will be established through an open process that encourages input from all interested parties.

California Guidelines for Reducing Impacts to Birds and Bats from Wind Energy Development does not duplicate or supersede CEQA, the California Endangered Species Act statutes or other legal requirements. This document does not alter a lead agency's obligations under CEQA, nor does it mandate or limit the types of studies, mitigation, or alternatives that an agency may decide to require. Because this document complements existing CEQA guidance, following these *Guidelines* will support efforts to comply with CEQA and other local, state, and federal wildlife laws and will facilitate the issuance of required permits for a project, providing a measure of regulatory certainty for wind energy developers. Wind energy developers who use the methods described in the *Guidelines* will secure information on impact assessment and mitigation that would apply to CEQA and to the other wildlife protection laws and will demonstrate a good faith effort to develop and operate their projects in a fashion consistent with the intent of local, state, and federal laws. Such good faith efforts would be considered by CDFG before taking enforcement actions for violation of a California wildlife protection law.

This document reflects close coordination of the Energy Commission and California Department of Fish and Game and advice from scientists and legal experts, as well as public input from wind energy development companies, counties, conservation groups and other non-governmental organizations, and private citizens. The Energy Commission and CDFG thank all those who participated in the development of these *Guidelines* and encourage lead agencies and all parties interested in the development of California's wind energy resources to use the *Guidelines* as a resource on all future wind energy projects.